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guide to the  
BBC MICRO!

# THE MICRO USER

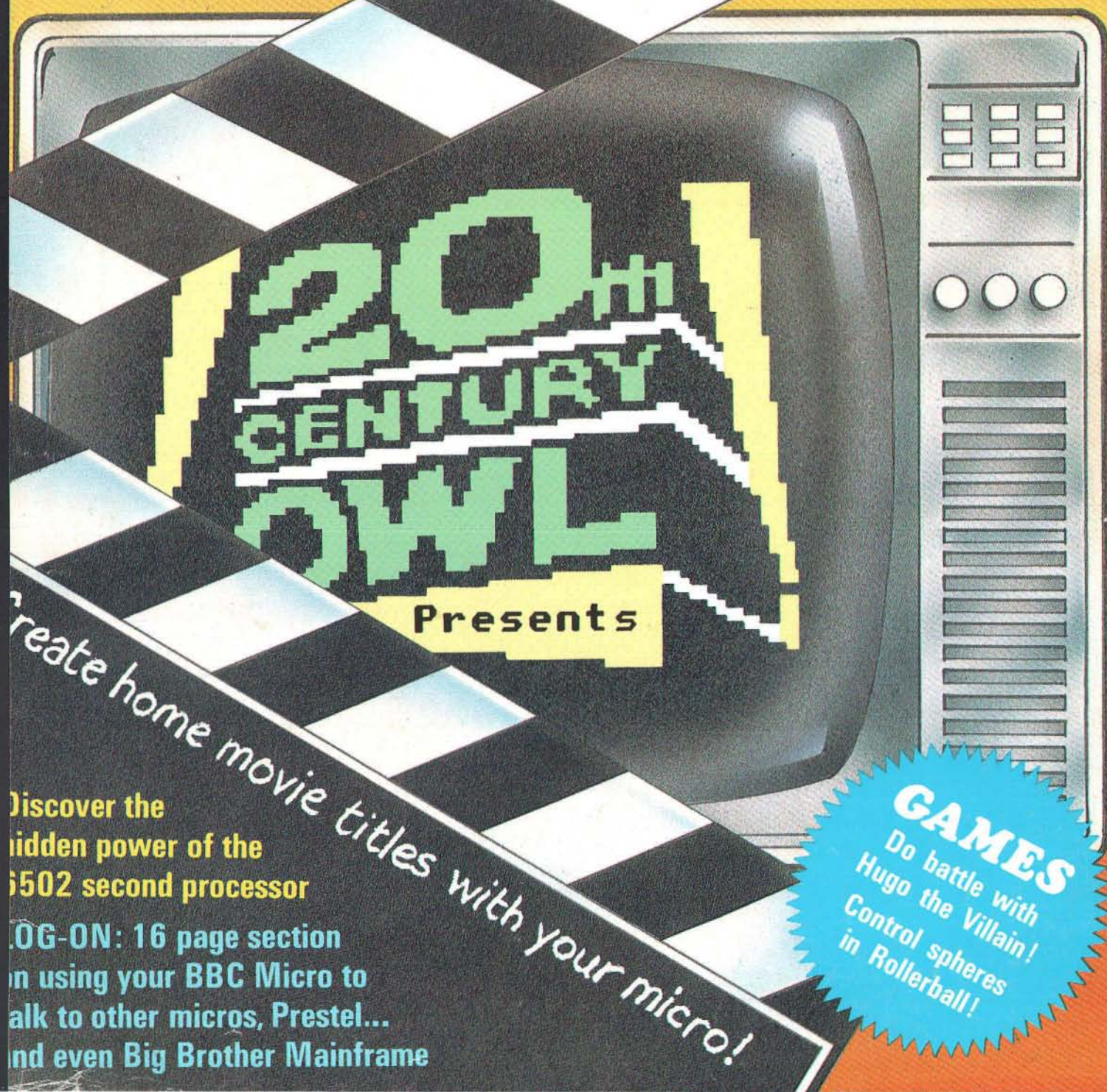
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Volume 2  
Number 7  
September 1984  
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-Page 79



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**GAMES**

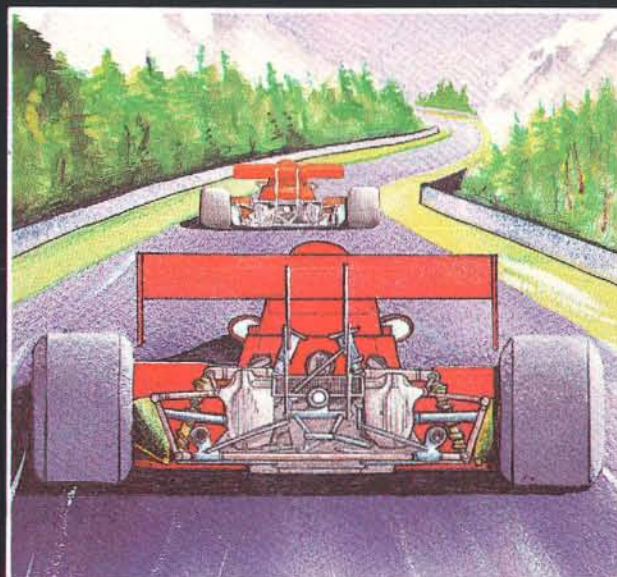
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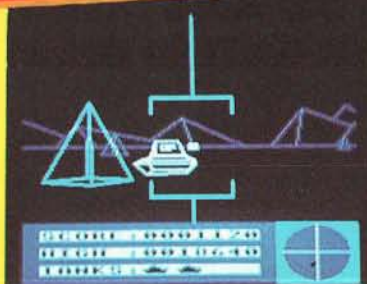
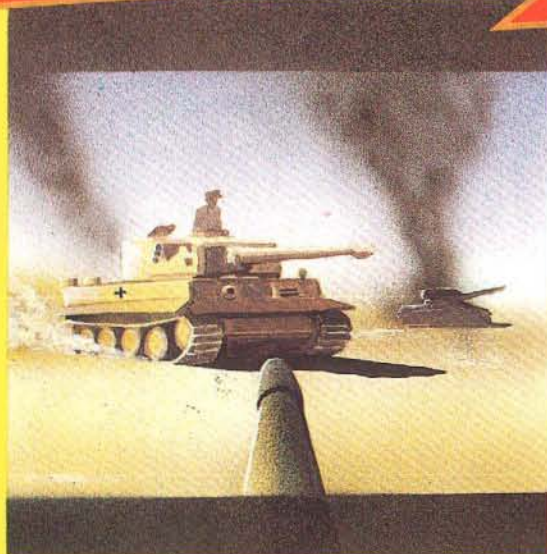
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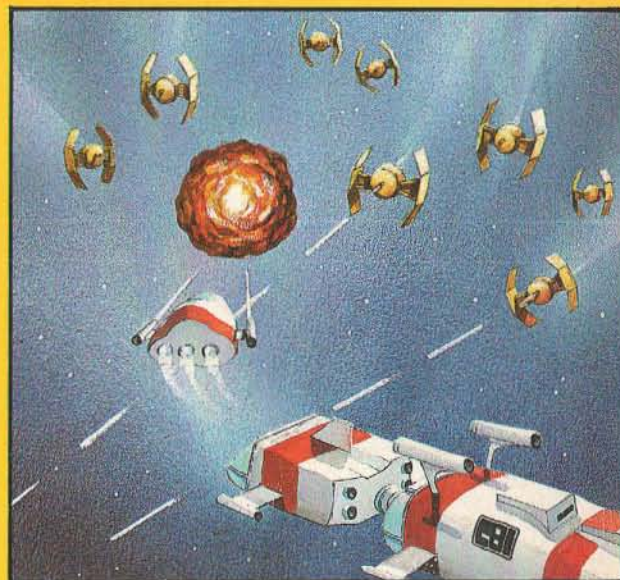
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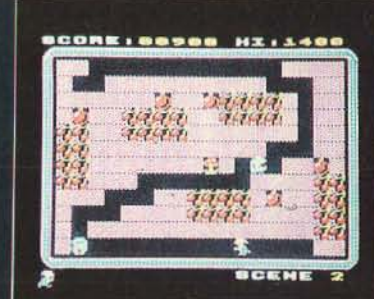
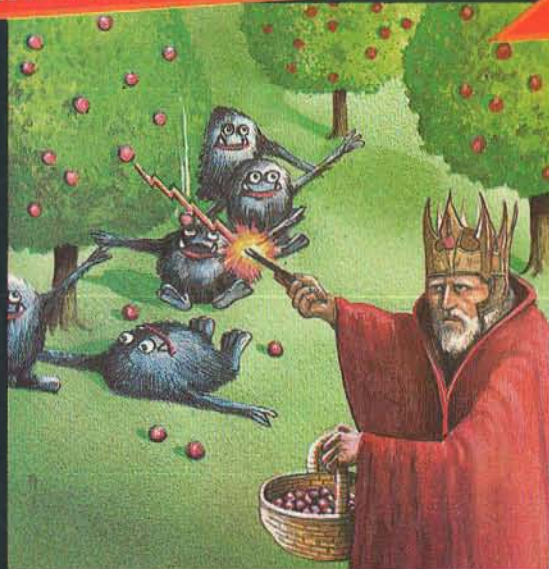
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The Torch upgrade will give you a sophisticated business/professional system. However it doesn't stop there — it gives you the potential to expand — an expansion that no other current system can offer. Today, (not promises of 'one day!'), we are able to offer Hard Disc capability, networking of up to 254 machines, right up to the extra processing power of a 68000 32bit processor with 256K RAM, and optional UNIX operating system. **The potential is here!** The TORCHNET system, (software is included with all systems!), is a cost-effective method of linking office computing equipment in a simple and expandable fashion. TORCH means communication, whether it is inter-room communication, automatic 'home-to-office' communication, or electronic mail allowing a Torch user to initiate telex transfers, send tele-messages, use Electronic Mail (e.g. Telecom Gold), and talk to large mainframes. — **The potential is here!** Hardware is of no use without a suitable range of software, and the Torch can choose from a massive range of business, financial, application and language software. (Did you know that the Torch system has five times more software available for it than the IBM PC!) Why not contact us for your requirements?



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IBM PC Compatible Upgrade for BBC B  
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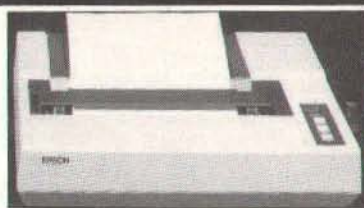
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Equally at home in the artists studio, hobbyists workshop, science laboratory, classroom, and production floor, this system has something to offer everyone. The 3-colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025 cm. over an A4 area — the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic colour plotter carries three colour pens each of which is software selectable.

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ideal way to ensure optimum performance of your drives. The use of disposable cleaning discs eliminate the risk of recontamination and abrasion, and ensure continuous data capture and transmission.

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We now stock the high performance yet economical 3M range. Due to advanced production techniques, a higher standard has now been reached, enabling Scotch to guarantee error free performance for life.

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## VIDEO DIGITISER

Supplied complete with integral power supply, and ROM based software, it interfaces with the computer via the 1Mhz bus. A signal supplied from any standard video camera/recorder will provide a high quality picture, with eight different grey scale levels. The friendly yet sophisticated menu-driven software comes complete with an Epson printer dump. £218(a)

## MONITORS:

**MICROVITEC**— a range of British Made DTI/ACORN Approved Std/Med/Hi-resolution RGB colour monitors that have a consistent, reliable performance. Also available in RGB/PAL/SOUND versions. The KAGA range provides a similar performance in 12" screen format. Our Japanese manufactured Hi-Res green screen SANYO is an ideal solution for high clarity 80 column text display. The KAGA green screen, with its 'chemically etched' anti-glare screen for the discerning user. All monitors are supplied with suitable leads at no extra charge.

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Continued on page 11

unless indicated as follows: (a) £8 (b) £2.50 (c) £1.50 (d) £1.00

## PRINTMASTER ROM FOR THE FX80

This sophisticated printer handling ROM will support the Epson MX, RX and FX range of printers, and includes many useful features. You no longer need several printer ROMs as 'this one does it all!'. **PRINTMASTER** will dump in all modes. Three types of screen dumps are available, the most flexible being **\*GDUMP** which operates in any graphics mode, displaying the colours as shades. Any part of the screen can be printed at any position on the paper in any one of the four orientations. The dump can be magnified by any factor x2, x3, x4 etc. A special feature allows true Mode 7 screen dumps with **TELETEXT** text and graphics, colours (as shades), double height etc. **\*TDUMP** allows any text mode to be dumped and **\*FDUMP** will print contents of a file on disc while the computer can be doing other things. The **\*DEFINE** function allows the user to define his own characters and the facility to save them. Commands can be called from Basic programs and language ROMs. All for only £28 (c).

## VIEW PRINTER DRIVER FOR EPSON FX80

This printer driver will enable the user to fully exploit the potential of the highly versatile Epson FX80 printer making text presentation both impressive and attractive.

A choice of 12 HT code options covering the full range of FX80's fonts is made available to the user. One of the options allows the user to call up the user defined characters stored in the printer buffer. However, the most powerful feature of the driver is its ability to offer the use of multiple HT codes in the same piece of text.

The booklet supplied with the driver includes illustrative examples and shows how to prepare and store formats for frequently used documents. Supplied on disc £7.00(c)

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## SIMONSOFT SPRITES VERSION TWO

FOR THE BBC 32K

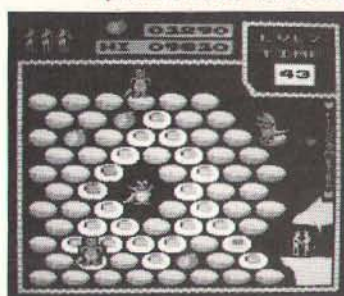
Transfer your ideas for multi-coloured characters directly to the computer and screen with the easy to use grid-based generator program. As you design the sprites they are automatically stored in our sprite routine which lies hidden under your program. The machine code sprite routine will move the shapes at incredible speeds of fourteen (14) times that of ordinary basic – and the routine is controlled with simple commands from your own Basic program!

Simonsoft sprites are used in programs on the market now. We claim no royalties on programs using our sprite routines.



### OG THE CAVEMAN at £7.95 BBC 32K (£9.95 disc version).

OG is in a calamity. His territory has been taken over by dinosaurs that lay eggs at a really hectic rate. Og must crush the brood before they hatch by jumping on to each and every egg. Og's problems are compounded by a pack of slavering dinosaurs hungry for his blood – and on higher levels by grand old Ma dinosaur herself. Og can use his magic staff to set a trap, but time is precious as Og knows all too well. Big bonuses can be scored for jumping on fruit, and an even bigger bonus for snatching a kiss from his waiting cavewife.



SCREEN PHOTOGRAPH

### SUPERFRUIT at £5.95 for the BBC 32K (£7.95 disc version).

Features full colour hi-res graphics, great sound effects, spinning reels, 5 x 4 display of fruit, "bounce" as each reel settles, nudge box, nudge gambles, two-way nudges, swap reels, hold reels, collect win, gamble any win, "loser's gamble" if first gamble is lost, Supergamble for the jackpot and a coin pile that shrinks and grows with your winnings. Separate instruction program. This implementation is in a class of its own.



SCREEN PHOTOGRAPH

**A MUST for anyone who wants to see their BBC's graphics stretched to the very limit.**

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- An ASTOUNDING FOURTEEN (14) FOLD INCREASE over the speed of ordinary Basic
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# EPROMER II

Our current version of the highly popular Eprom programmer is now being enhanced to provide more and better facilities for easy programming by the user. The software will maintain its superiority over all currently available similar programmers. The range of eproms handled has been widened, to include

the eproms with lower programming voltage and eproms which can be programmed using the fast algorithm. Control of all operations has been moved to the keyboard. The screen display has been improved to give more information. The screen editing facilities have also been modified to simplify the data entry.

### Preliminary Information

- \* The new Eprom Programmer will now program 2516, 2532, 2564, 2716, 2732, 2764, 27128 and 27256 + 5v eproms, and all but the 27256 in a single pass.
- \* The programmer will be supplied with integral power supply, and interfaces with the BBC via the 1MHz bus. It is fully buffered and complies with Acorn protocols. There is no power drain from the computer.
- \* No knobs or switches to fiddle with — total control from the keyboard
- \* Fully software driven with easy to understand instructions displayed on the screen.
- \* Eprom type selectable from the keyboard
- \* Selectable programming voltage 25/21/12.5V

- \* Defaults to normal programming with high speed algorithmic programming selectable, for a device with suitable capability.
- \* Continuous screen display of eprom type, option and address range selected.
- \* Full screen editor with HEX or ASCII input. Constant display of logical eprom address.
- \* Can read, blank check, program and verify at any address/addresses on the eprom.
- \* Full Tape/Disc filing facility.
- \* Several basic programs can be entered on a single eprom and called up with individual name.

## EPROM ERASERS



UV1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. £59 + £2p&p. UV1 as above but without the timer. £47 + £2p&p.

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## GEMINI'S DATAGEM

### The Definitive Random Access, 24K ROM based Database Management System

This is the first truly flexible database for the BBC micro which will have an application to offer in almost any field one can imagine.

\*The file size is almost unlimited (Maxm. 10 Mbytes)

\*System will support up to 4 drives

\*Maxm. No. of records/file: 5000

\*Maxm. record size 6K

\*Maxm. No. of fields 62.

\*9 level hierarchical search system with facilities to store results of searches.

Searches can be any one of the following: Search, Include, Exclude, Combine, Common or Difference.

£112.00 + £2 carriage

**SPECIAL  
OFFER  
EPSON FX80  
PRINTER  
ONLY £325**

including BBC printer lead  
Twelve Months full warranty.

## 'TIME-WARP' REAL-TIME-CLOCK/CALENDAR

A low cost unit that opens up the total range of Real-Time applications. With its full battery backup, possibilities include an Electronic Diary, continuous display of 'on-screen' time and date information automatic document dating, precise timing & control in scientific applications, recreational use in games etc — its uses are endless and are simply limited by one's imagination. Simply plugs into the user port — no specialist installation required — No ROMS. Supplied with extensive applications software.

Please phone for details.  
£29.00 + £2.50 carriage.



## SMARTMOUTH

The original 'infinite speech'.  
Still the best.

A ready built totally self contained speech synthesiser unit, attractively packaged with built-in speaker, AUX output socket etc. — no installation

problems! It allows the creation of any English word, with both ease and simplicity, while, at the same time being economical in memory usage. You

can easily add speech to most existing programs. Due to its remarkable infinite its uses spread throughout the spectrum of computer — these include industrial, educational, scientific, No specialist installation — to open your computer, simply the the user port — and simple software, no ROMS are needed.

SMARTMOUTH is supplied with demo and development programs on cassette, and full software instructions. £37 + £2.50 carriage.



## BUZZBOX

This is a full specification, direct connect modem, with both Originate and Answer modes, allowing access to the many databases, bulletin boards, as well as inter-computer communications. The modem conforms to the international CCITT V21 300/300 Baud standard. (NOTE: Not suitable for PRESTEL). Having full BT Approval, it connects directly to the telephone line, for optimum performance. Being battery powered, it is totally portable (optional power supply available). £69. BBC Lead £3.50. External PSU £8.00.

## BEEBUGSOFT

A professional range of Firmware/Software to suit both the advanced programmer and the user. From the well known 'EXMON' and 'TOOLKIT' to the WORDWISE SPELLCHECK.

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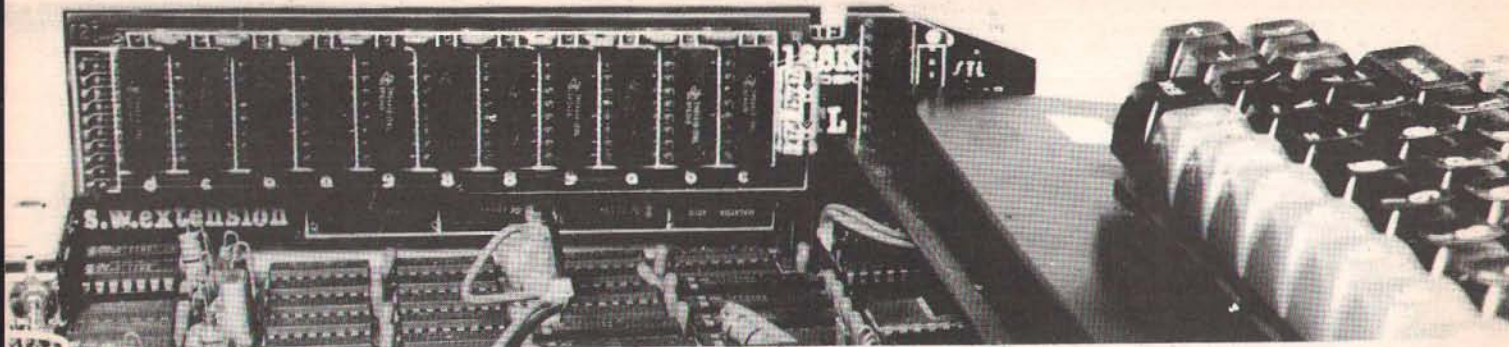
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## SOLIDISK SIDEWAYS RAM: 8,000 UNITS SOLD



**"Exciting" (ACORN USER JAN 84), "Power to your Beeb" (PCN 61, MAY 84)**

### HOW ABOUT COMPATIBILITY?

The Sideways RAM is completely compatible with all issues of BBC computers, disks, all sideways ROMs, second processor, Torch disk pack, Teletext, Econet etc. but NOT with ROM extension boards, since it can replace them.

Its power consumption is so low that you can use it in conjunction with twin disks.

### HOW DOES IT WORK?

Occupying the same place as sideways ROMs (such as BASIC, DFS, CPN etc), it is treated like other Sideways ROMs and therefore can replace them.

The Machine Operating System uses Sideways RAMs as naturally as Basic, without procedures or programming rules.

Sideways RAM can run any language, any filing system including Hi-Basic and second processor DFS.

### SIDEWAYS RAM POWER IS IN THE SOFTWARE:

Different from Sideways ROMs, Sideways RAM can be written into. This property gives birth to a NEW GENERATION of software for the BBC computer: SERVICE RAMs and VIRTUAL MEMORY PROCESSOR.

Each SERVICE RAM has its own commands and code as its counterpart Sideways ROM but has its own private workspace and storage area thus leaving you with the lowest possible PAGE value (PAGE=&E00). On the other hand, the Virtual Memory Processor can run huge MACRO BASIC programs (Megabytes are not the limit), keep them on disk and uses the basic 32k of RAM as transient program area. All software for the Sideways RAM system is free.

### FREE SOFTWARE?

Solidisk Sideways RAMs is bundled with lots and lots of software, FREE and we mean FREE, now and later. It is quite simple: for every Sideways RAM sold, £1 is spent on MORE software. Sideways RAM users are invited to spot new applications and contributions are rewarded at the usual rate of £1 for every 4 bytes of machine code.

The result is printed on the opposite page.

### HOW ABOUT THE FUTURE?

Solidisk Sideways RAM is also widely used in schools for ECONET stations, by professional programmers for writing programs, research laboratories for RAM disk data base, at home for wordprocessing and now even games.

New areas are being developed: Telesoft and Teletext logging, Speech Processor assembler and Relational Data base to cite a few.

As the price of 16k EPROMs are as high as £20 at the present time, more Sideways ROM software publishers will be willing to sell their software on disk. Solidisk will mail FREE OF ANY COST their advertisement to ALL Sideways RAM users providing the price of the Disk version reflects savings in the cost of the ROMs. Solidisk believes that the majority of BBC users will have their Sideways RAM fitted before the end of next year.

Also unlike other makes (SIR, APTL, WE Sideways ROM/RAM extension boards and the Aries B20), Solidisk Sideways RAM is expandable from 16k right to 128k and now to 208K. As a result of VLSI technology and volume of sales, Solidisk products also have a lower shop price than any other products.

### OTHER PRODUCTS FROM SOLIDISK:

#### UVIPAC EPROM ERASER:

Uvipac is powered by the mains, simple to operate and can erase 3 Eproms of any type in just 15 minutes. Uvipac is ideal for home use.

#### DETACHABLE KEYBOARD CASE:

Remove the keyboard from the BBC computer and instal it in the new case. Replace the old 3" keyboard tail by the new 24" cable and you can work really in comfort even for very long hours. The keyboard case is more a productivity tool than just ergonomics.

#### CPU CASE:

Replace the top of the BBC computer case by this metal CPU case. Sit your monitor on top (it is tough enough to take even your weight!). The CPU case has 2 compartments for half height 5.25" disk drives with fixing screws, air vents and provision for a bolt-on fan. At first sight, there is no trailing wire. Looking inside, there is enough room to accomodate Teletext Adapter, Second Processor, Solidisk and a fan!

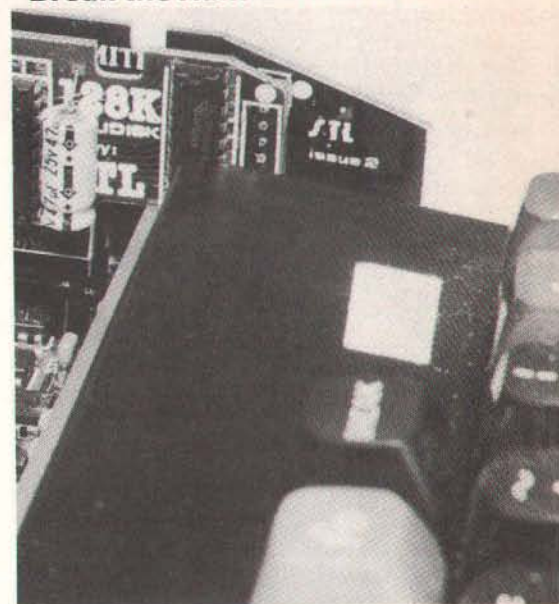
#### DOUBLE DENSITY DISK INTERFACE:

2 versions of this double density interface will be available: as direct replacement for the Acorn Disk Interface (Version A) and as a Second Disk Interface (Version B) adding to your existing interface. They all use the same Western Digital controller chip (WD1770). Price £39.95 inclusive

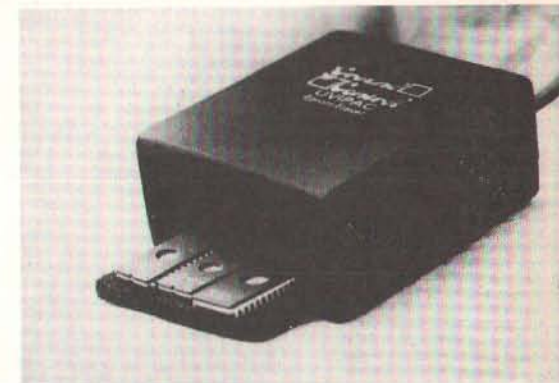
#### DISK DRIVES:

3 models are being offered:  
STL55A: 40 tracks single sided, STL55F: 2 x 80 tracks, double sided and the best of mini floppy technology STL320: 2 x 160 tracks, double sided.  
All disk drives are supplied with cables, formatter disk, head cleaning kit and 2 year warranty.

**"Break the Ram Barrier" (A&B)**



UVIPAC EPROM ERASER



TEAC DISC DRIVES FD55 Series





## WHICH SIDEWAYS RAM DO YOU NEED?

Solidisk Sideways RAM is available in 16k (SWR16), equivalent to 1 sideways ROM, 32k (SWR32), equivalent to 2 sideways ROMs, 128k (Solidisk), equivalent to 8 sideways ROMs and the 208k Solidisk equivalent to 12 Sideways ROMs. You can buy a small Sideways RAM now and upgrade it later. From the SWR16 to the SWR32 is by straight exchange, from the SWR32 to the Solidisk is by adding the 96k Solidisk Extension, from 128k to 208k is by exchange of the RAM card.

### FREE SOLIDISK SOFTWARE:

#### WORD64:

WORD 64 is a Service RAM, it uses Solidisk as storage for WORDWISE, up to 64K free characters for any text.

#### SILEXICON:

SILEXICON is a Spelling Checker for Solidisk. SILEX scans texts at more than a 1,000 words a minute and compares each word against the dictionary, Silexicon marks the mis-spelt words for either addition to the dictionary or eventual correction.

#### PRINTER BUFFER:

PRINTER BUFFER is a Service RAM, it increases 500 times the normal 32 bytes printer queue to 15K bytes, completely transparent to the user. PRINTER BUFFER is as useful for printing a long document as for a short program listing.

#### STLEO:

STLEO is a Service RAM, it is Disk Filing System that leaves PAGE at &EOO, has built-in disk formatter/verifier and automatic track stepping for 40/80 track disk drives.

#### STL150:

STL150 is a Service RAM to enhance Acorn's .90 DFS to offer up to 150 directory entries per side.

#### STL-RFS:

STL-RFS (RAM/ROM filing system) is a Service RAM and an innovation in portable applications. STL RFS saves any program in a Sideways ROM format, it can then be copied onto EPROM to give instant recall of your programs. Plug this EPROM into any sideways socket, type \*RFS and it runs itself. Compatible with the ELECTRON and BBC, tape and disks, SWR16, SWR32 and Solidisk.

#### INDEX:

INDEX is a Service RAM, it stores all the entry points of one or several sequential data files such as mailing list, stock list, accounts etc, merges, sorts them in alphabetical order and gives instant access to any record. INDEX can handle 1,100 records of any size, any type, any number of fields.

#### MACRO-BASIC:

MACRO-BASIC is a program generator. You use a wordprocessor to create a command file which is then scanned by MACRO. MACRO uses other programs, subroutine libraries, text files (actually any or all files on your disks) as source to generate a bug free BASIC program which can be very large (Megabytes are not the limit).

#### VIRTUAL MEMORY PROCESSOR:

VIRTUAL MEMORY PROCESSOR (VMP) uses extensively overlay technique and Solidisk as back store for very large programs that cannot be run otherwise. VMP uses the 32k basic RAM as transient area: it operates on a Main Program as generated by MACRO-BASIC, taking different segments from the Solidisk Store, POOL, HOLD, FREE or CLEAR segments from the transient area. For example: VMP will accept 20 segments of 10k of Basic assembler and assembles it into 16k of machine code.

#### MENU:

MENU puts all computer's resources at your fingertips. MENU displays your Sideways Firmware, Disk Directories, Sideways RAM system, Solidisk System etc.

### MORE FREE SIDEWAYS RAM SOFTWARE TO COME:

While others are making promises for software to be written, Solidisk Systems RAM comes with a complete, novel and powerful software package including compatibility with existing sideways software.

Each Sideways RAM is accompanied by the Sideways RAM User Manual, full 1 year warranty, 1 utility disc\* and free mailing on all new publications from the Software Support Service.

\*It should be understood that we cannot put as much free software on a 40 track single sided as on a 80 tracks. The present software package require 160 tracks of storage and can be accommodated on ONE 2 X 80 track double sided diskette, only the most useful programs are supplied on other formats (ie 40 track single sided, 2 X 40 track double sided, 80 track single sided). Should you require the whole collection of free software, please place an order for extra disks. For the technical minded: the Source Code and Technical Manual (3 floppies and a 300+ page book) price = £10, the SILEXICON EXTENSION PACKAGE (3 floppies and a 40 page manual, 30,000 word dictionary: English and French now, German and Spanish planned) price = £9.00. '4S' also publishes regular updated SWR utility discs at £3.00. Every user can do contract work for the SUPPORT SERVICE and make a lot of money for him/herself!

### HOW TO ORDER?

You can order any item using the coupon. Post and packing is only charged once. Access and Barclay card holders can place their order by phone. Educational authorities, Acorn dealers and OEMs can obtain quantity discounts.

Name: .....

Address: .....

Credit Card Account: .....

Callers are requested to ring first for appointment.

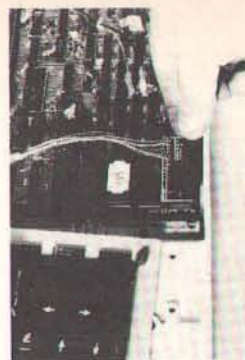
Total: £

If ordering more than one item, deduct £1 per item as post and packing cost is only charged once.

**SOLIDISK TECHNOLOGY LIMITED**  
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SOUTHEND-ON-SEA  
ESSEX SS2 6JQ

**SOLIDISK'S NEW TELEPHONE NUMBER:**  
SOUTHEND-ON-SEA (0702) 354674  
(10 lines with automatic exchange)

### HOW EASY TO INSTALL:



Push in the base unit



Connect the control wires

### PRICE LIST (including VAT and post & packing)

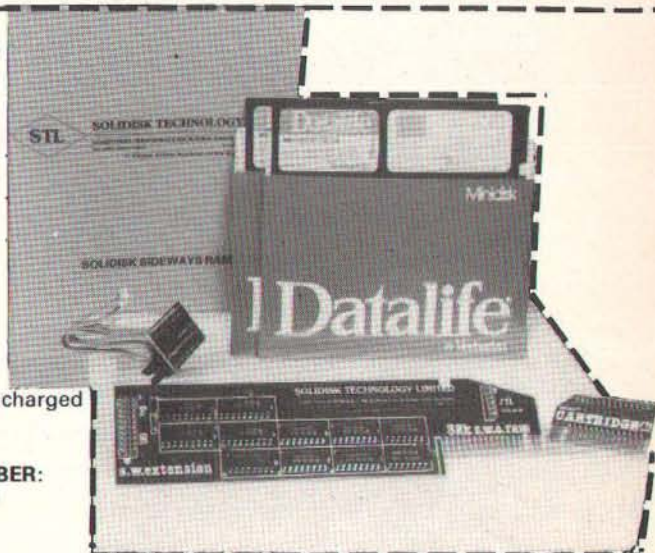
<b>SIDEWAYS RAM:</b>	
SWR 16K	£43.65
SWR 32K	£59.95
128K SOLIDISK	£150.95
208K SOLIDISK	£243.00
The following are upgrade prices for existing Sideways Ram owners:	
16 - 32 (please return complete item)	£18.00
16 - SOLIDISK (please return complete item)	£109.00
32 - SOLIDISK (no return necessary)	£93.00
128K - 208K SOLIDISK	£93.00

<b>DISK DRIVES:</b>	
STL55A (40 track, single sided, cased with cables, diskette, manual and 2 years warranty)	£142.95
STL55F (2 X 80 track, double sided, as above)	£232.95
STL320 (2 X 160 tracks, double sided, as above)	£499.00

<b>FLOPPY DISKS (DATALIFE Verbatim):</b>	
MD525 (SS/DD 40 or 80 track) box of 10	£16.00
MD550 (DS/DD 40 or 80 track) box of 10	£22.00
MD557 (DS/DD 98 TPI) box of 10	£27.00

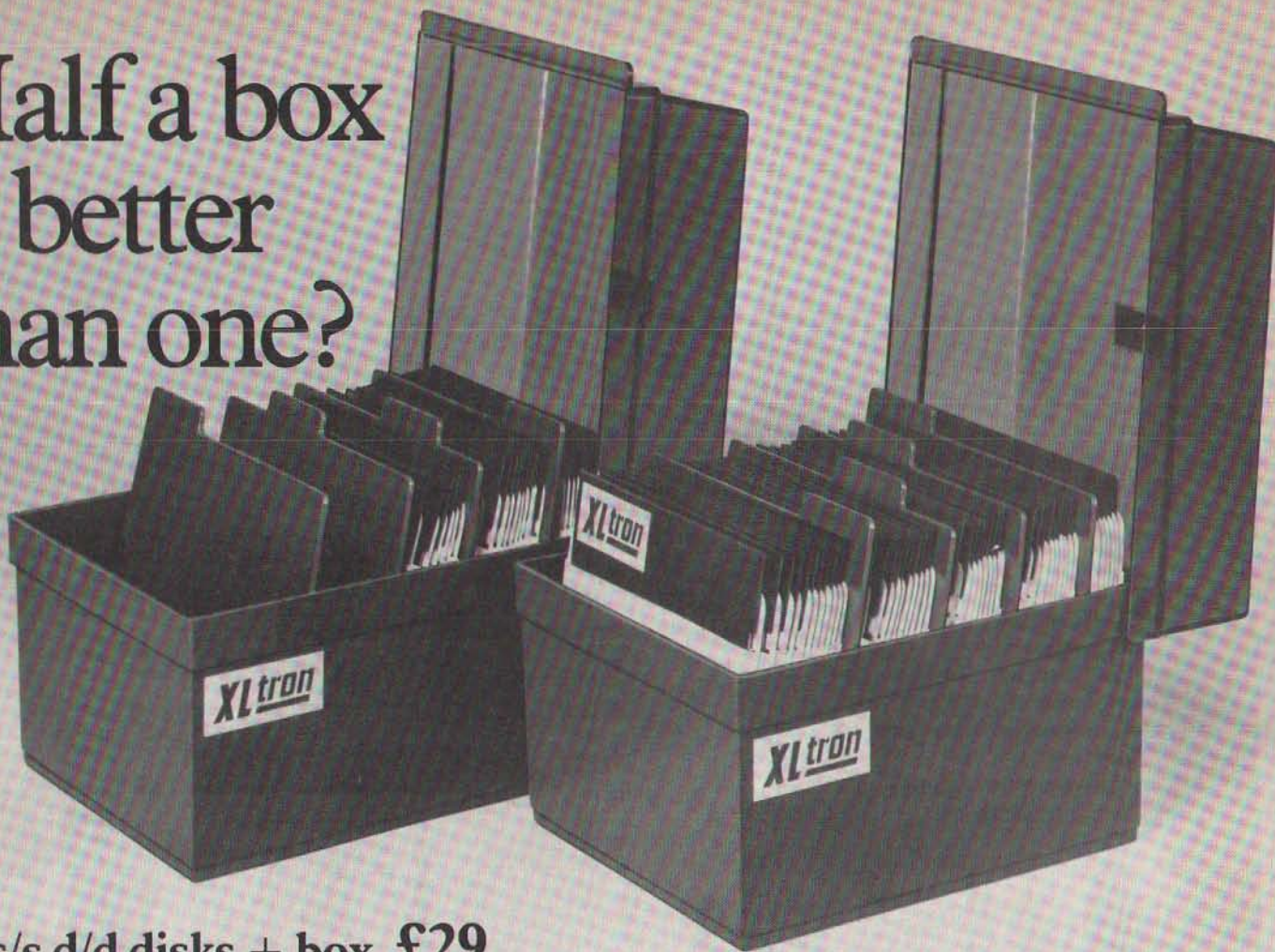
CPU CASE	£13.00
DETACHABLE KEYBOARD CASE	£27.99
EPROM PROGRAMMER (used with Sideways Ram)	£16.00
UVIPAC EPROM ERASER (free standing unit)	£20.95
2764 PACK OF 5	£36.00
SOURCE CODE + TECHNICAL MANUAL	£10.00
SILEXICON EXTENSION PACKAGE	£9.00

**WE STOCK A LARGE RANGE OF PRINTERS AND MONITORS. CALL OUR SALES OFFICE FOR IMMEDIATE QUOTATION.**





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We ran the advertisement opposite to move some stock left from a cancelled order. And move them it certainly did. We're still selling around 30 boxes a day, that's over 30,000 disks a month. So we bought some more, and are going to continue selling at the same price.

We also got a lot of people on the phone asking if we could supply slightly fewer disks, and as you see, we're now offering boxes in 25's as well.

Every order of 25 or 50 comes packed in the same rigid plastic storage box with four dividers, we've kept the same high specification and all disks carry our two for one guarantee.

To order, just clip the coupon below. Personal callers welcome.

We accept orders from all government bodies, schools, universities, libraries, armed forces etc. We despatch on receipt of an official purchase order. If you can't raise a cheque without an invoice please post or telephone your order and we'll send you a proforma by return.

**Disco Technology Limited, Lex House, 3/6 Alfred Place,  
London WC1, England. Telephone 01-631 0255,**

**50 s/s d/d disks + box £50**  
plus VAT and P + P

**50 d/s d/d disks + box £75**  
plus VAT and P + P

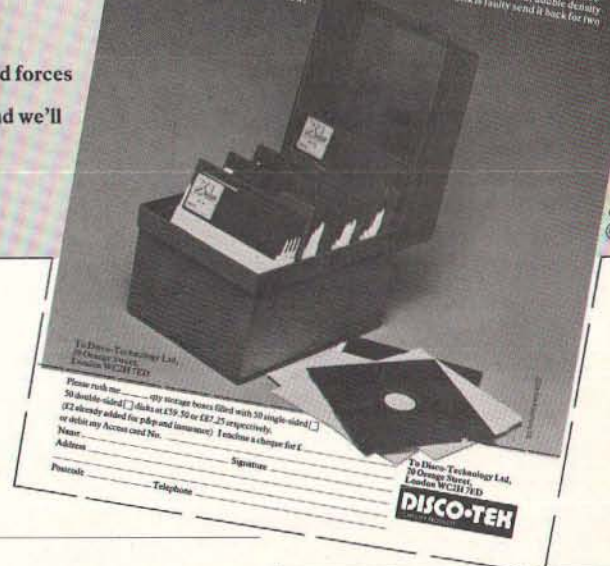
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Disco Technology Limited, Lex House, 3/6 Alfred Place, London WC1, England. We'll sell them to practically anyone, anywhere. So when we got a telephone order for a lot of storage boxes and disks we didn't waste any time and stocked up. Then the order was cancelled. So we're having to let them go at cost, in fact, less than cost.

For just £50 we can supply a rigid, high impact plastic storage box, with four dividers packed with 50 single-sided, double-density disks. The same storage box filled with 50 double-sided, double density disks will cost just £75. And all carrying our five year guarantee - if a disk is faulty send it back for two free replacements.

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MD557 D/S 96 tpi	36.90	35.90	34.90

48 tpi suitable for 35 or 40 track operation

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Part No:	5-MB DS505	10-MB DS510	15-MB DS515	20-MB DS520
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EPSON QX10	1190.00	1290.00	1390.00	1490.00
DEC LSI 11	1390.00	1490.00	1590.00	1690.00
Z80 System	1190.00	1290.00	1390.00	1490.00
S100 System	1290.00	1390.00	1490.00	1590.00

Slaves may be added at these lower prices

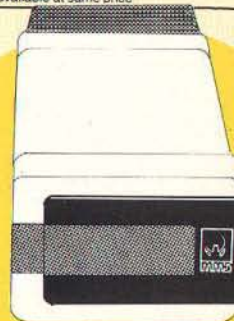
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We supply all Government bodies including Schools, Universities, Colleges, Hospitals, the Utilities, Research Establishments, Armed Forces, the Ministries and Local Authorities world-wide. We will despatch within 4 (YES 4) working hours from receipt of your official order number received either by post or by telephone, and all orders are handled in the strictest confidence and to the letter. All other customers cheques with order please payable to DISKING. If you are a large establishment, and cannot raise cheques without an invoice please post or telephone us your order, and we will send a pro-forma invoice by return, for your accounts department to pay against.

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If you're posting your order, omit the word FREEPOST from our address, and use our normal post code GU30 7EJ and do not forget to stamp it First Class. If you are telephoning your order please make it clear that you wish to pay for your goods to be sent to you by First Class Post.

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Don't keep sitting there in front of your VDU, get outside and fly our aeroplane. Just call and ask for your flyer, and we'll send you our latest trade pack with prices, special offers and sample unlabelled diskette and mailer. We'll also enclose a DPC application form telling you how to buy at our 10,000 prices yet order only in 50's.

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Diskette binders at £4.90 each (normally £9.90) p&p 50p each, 10+ post free.

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Supplied in a FREE SEE 10 library box

PRICES EXC VAT	10-40	50-90	100+
S/S 48 tpi Diskettes	13.90	12.90	11.90
D/S 48 tpi Diskettes	20.90	19.90	

Don't be fooled - these diskettes are brand new and come with our normal full money-back guarantee. They are mostly non hub ring labelled or unlabelled BASF, Dysan, Rhone Poulenc, Memorex etc. where the boxes have had the cellophane removed. We are even supplying them in a FREE SEE 10 library box!! At these prices you can't lose - Hurry!

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The Graduate.

The first IBM PC  
compatible upgrade  
for the BBC model B micro.



# From only £764.00 the new Torch Graduate will upgrade your BBC Model B to a powerful 16 bit business computer

## TECHNICAL SPECIFICATION

- 8088 16-bit processor running at 5 Mhz
  - 128K or 256K RAM
  - MS™-DOS operating system customised to IBM compatibility
  - Model G400 – Single, double sided, high density disc drive (320K formatted)
  - Model G800 – Twin, double sided, high density disc drives (640K formatted)
  - Integral stabilised power supply
  - 2 IBM PC compatible hardware expansion buses
  - Software compatibility allows Lotus 1-2-3 and all popular IBM PC business programs to run without modification, subject to the constraints of the BBC keyboard and display
  - Disc interface is not required
- Keyboard text and graphics supplied by BBC Model B

### • THE GRADUATE •

Disc and hardware compatible with the IBM PC, the Graduate is the latest addition to the Torch range of BBC upgrades. It's MS™-DOS operating system is customised to IBM compatibility allowing exploration of the massive range of IBM compatible business software, programming aids, compilers and languages universally available from most major software houses.

### Introduction to MS™-DOS

The Graduate offers two levels of upgrade, the G400 and the G800, both with 128K on board user memory as standard (optionally 256K). This can be increased to 1.2 Mbytes with an IBM compatible expansion board. The G400, contains a single, double sided 320K formatted disc drive and provides the low cost introduction to MS™-DOS for the

user who wants real 16 bit power from his Model B.

### More data storage

A step up from the G400 is the G800 which offers twin, double sided 320K disc drives for extra data storage. Both the G400 and the G800 provide the possibility of further expansion for networking, modems, etc., via the IBM compatible hardware slots provided

by the Graduate models. Each model comes complete with a well written user/technical manual and connecting leads.

### Just plug it in

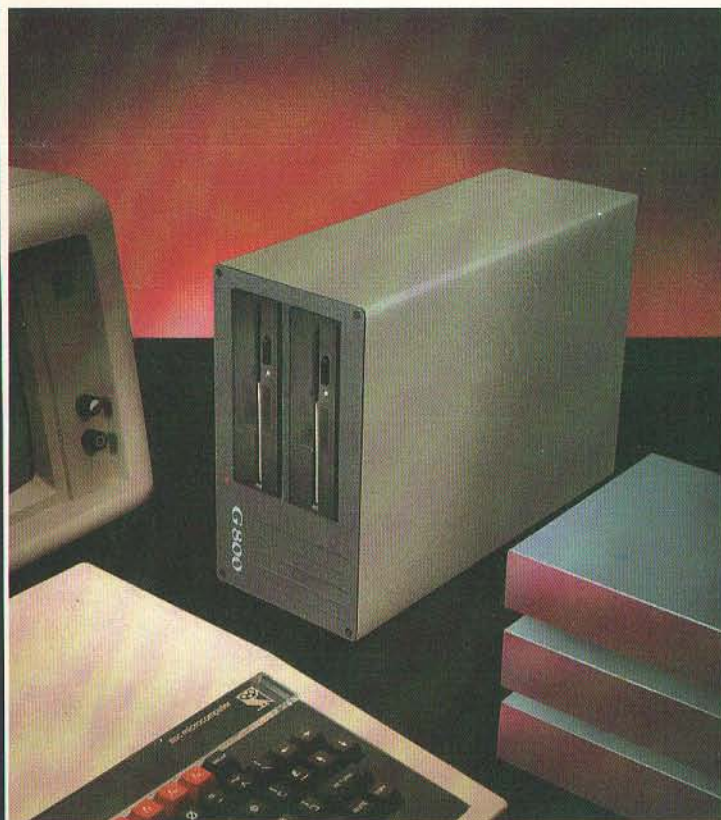
Unlike other add-ons there is no need to open the BBC to make the connection. The compact and tidy Graduate models simply plug in to the 1MHz bus on the Model B. Within minutes you can be up and running with an IBM PC compatible system that really means business.

### The range

Add 256K RAM, 640K disc storage and IBM PC compatibility to the BBC Micro for less than £1,000.

Graduate G400 (128K) £764 inc. VAT  
Graduate G400 (256K) £815 inc. VAT  
Graduate G800 (128K) £949 inc. VAT  
Graduate G800 (256K) £999 inc. VAT

For further information complete the coupon today.



## TORCH COMPUTERS



### Lighting the way ahead.

Torch Computers Limited  
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Telephone (0223) 841000. Telex 818841 TORCH G.

The Graduate is manufactured by Torch Computers under licence from Data Technologies Ltd.

To: Torch Computers Ltd., Abberley House, Great Shelford  
Cambridge CB2 5LQ. Telephone (0223) 841000  
Please send further information on the Graduate and the  
address of my nearest dealer.

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

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# Introducing BEEBUGSOFT

Until recently a very special range of applications and utility packages for the BBC micro has been unavailable to the general public.

This software has been produced by the BBC user group BEEBUG for its members. BEEBUG members tend to be a demanding and discerning group of individuals; and the range of software produced has been kept to a consistently high standard through their constant vigilance.

As a result, BEEBUG software is highly acclaimed amongst BEEBUG's 25,000 members. Independent reviews from the major computing magazines seem to take a similar view of the software, as you can see from their comments.

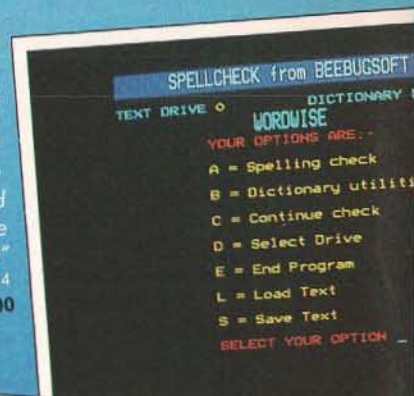
## SPELLCHECK

The disc based spelling checker for text created on Wordwise or View.

"... invaluable ... fast and reliable ... a worthwhile investment"

PCN February 1984

Disc £19.00



## TOOLKIT

27 new commands in eeprom to speed up Basic program development and debugging.

"... an indispensable aid"

EDUCATIONAL COMPUTING March 1984

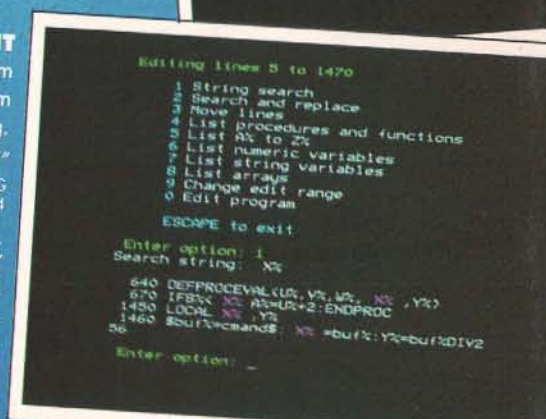
"... worth every penny ... highly recommended"

COMPUTING TODAY June 1984

"... its range of utilities is excellent"

MICRONET May 1984

Eprom £27.00



## SPRITE UTILITIES

A game writers utility pack enabling high speed arcade games to be quickly written in Basic.

"... definitely recommended ... excellent"

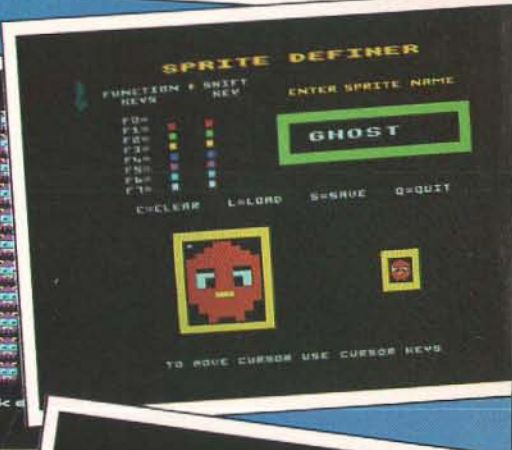
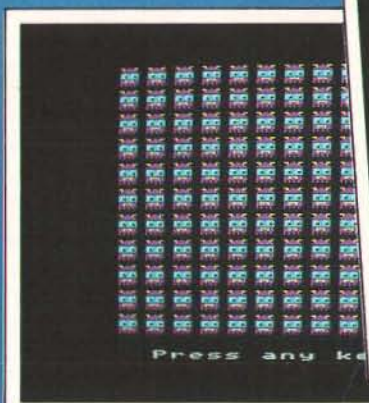
ELECTRONICS AND COMPUTING May 1984

"... Sprite Utilities wins through"

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## PAINTBOX

Probably the ultimate joystick drawing package on the BBC Micro, great fun and highly educational.

"... amazingly versatile ... easy to use ... (one of the most feature laden picture creating programs around) ... tremendous potential"

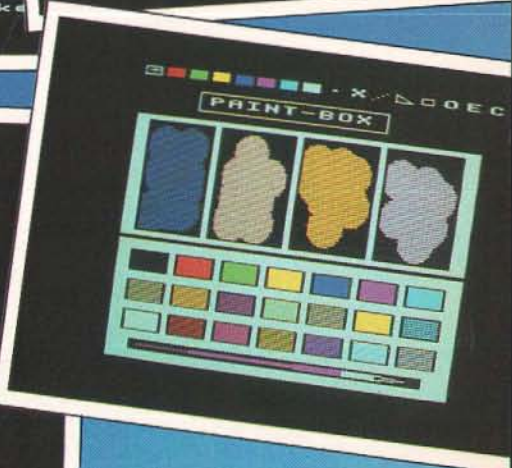
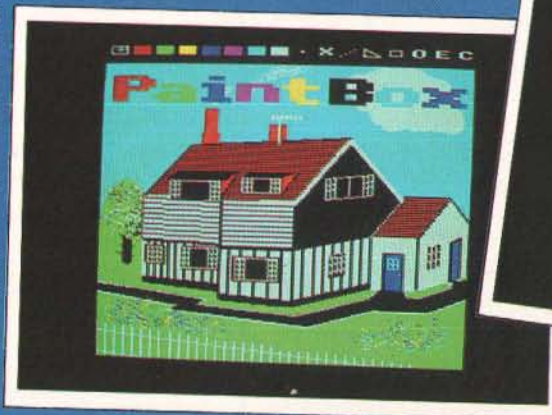
EDUCATIONAL COMPUTING Jan 1984

"... a very sophisticated and versatile utility"

ELECTRONICS AND COMPUTING May 1984

Cassette £10.00

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### TELETEXT PACK

A powerful screen editor for quickly creating Teletext Mode 7 screens.

"... provides teletext editing facilities in a well thought out manner"

ELECTRONICS AND COMPUTING April 1984

"... a very neat utility"

MICRONET April 1984

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Cassette £10.00 Eprom £27.00



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"... works well and offers an efficient database"

PCN November 1983

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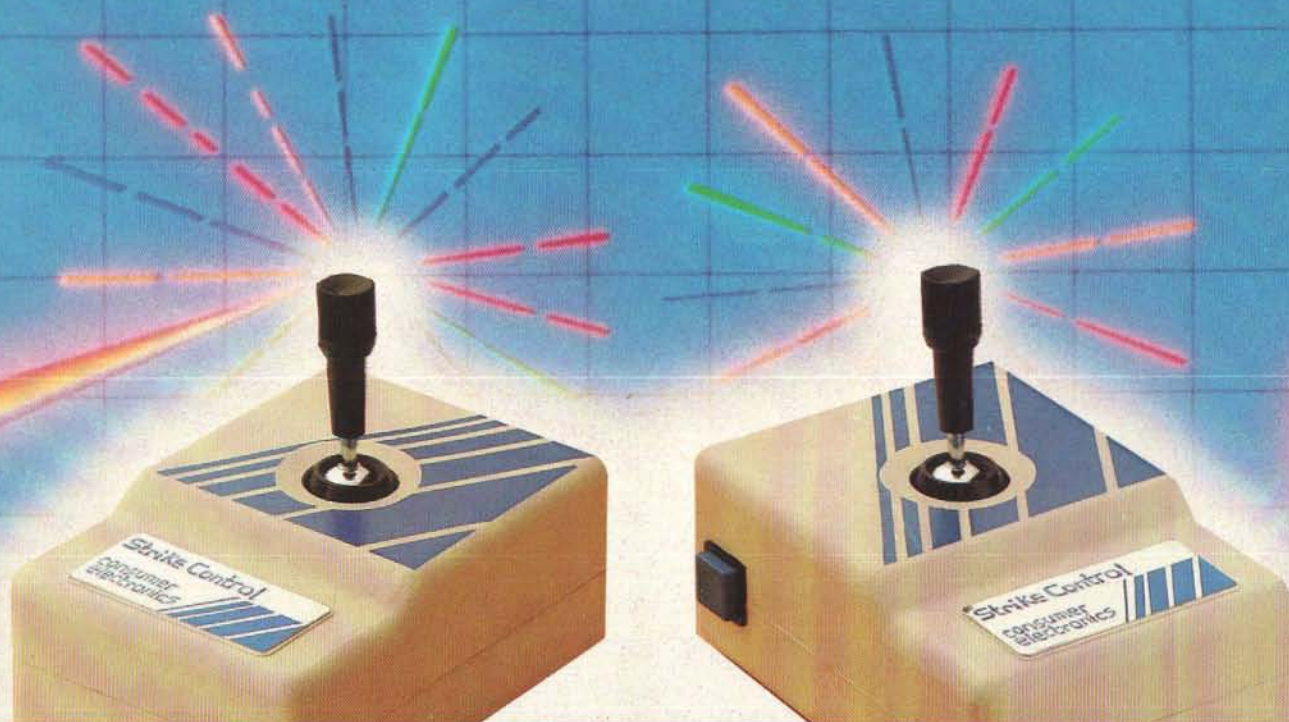
# Strike Control

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of companies concerned.



**ABM on target**

THE mysterious Acorn Business Machine range is still on schedule to make an appearance in September, according to a source close to the company's decision makers.

The ABM is said to be a full scale business micro incorporating integral screen, disc

drives, and including "significant" bundled-in software.

As a late entrant to the competitive single-user small business market, its penetration is a matter of conjecture.

Even the price range produced a "no comment" response from official Acorn channels.



THE future of the BBC Micro has been assured for another four years with the signing of a new contract for its manufacture and distribution.

This is a setback for Sir Clive Sinclair's often expressed hopes of increasing his share of the educational market.

Commenting on the deal, Acorn's Chris Curry said: "The BBC Micro is, and will remain, the keystone of an expanding system, capable of meeting the needs of a wide

range of users.

"Acorn, in association with the BBC, will be developing the system further to ensure it benefits from future technology, while maintaining its unique core of compatibility".

● Pictured signing the new contract are (left to right) Acorn founders Hermann Hauser and Chris Curry with Byron Parkin and Bill Cotton, managing director and chairman respectively of BBC Enterprises.

**BEEB MARCHES  
ON MOSCOW**

ACORN is poised to invade Russia following the announcement that the Western nations have lifted their embargo on sales of the BBC Micro to the Soviet bloc.

The company is currently aiming to secure a major share of the 8 bit Russian market which experts estimate will be worth up to 180 million US dollars over the next five years.

It has already allocated £50,000 to developing a Russian keyboard for the BBC Micro, Russian software and to translate all the technical manuals into Russian.

Spearheading the drive to win a contract for the BBC Micro and training and technical support in Russian schools is 3SL Overseas, Acorn's official Eastern European distributor based in Cheshire. One of their direc-

tors, David Pringle, has recently returned from the latest of a series of promotional raids into Russia to secure a foothold for the BBC Micro.

However Acorn expects to face fierce competition from Sinclair whose ZX 81 and Spectrum machines have also been cleared to be sold behind the Iron Curtain.

The Russian market

has opened up as a result of the United States easing its stranglehold on Cocom - the coordinating committee controlling high tech trade with Eastern Europe.

While the Americans continue to dominate the organisation, which is made up of Nato member countries plus Japan, they have agreed to allow a number of "smaller" computers - including the BBC Micro - to slip through the net.

**Networking**

But as the United States holds to the line that almost all computers still have military applications - they claim that an Apple II can guide a Minuteman missile - they have insisted that those micros from which the embargo has been lifted cannot be sold with any networking capability.

Acorn International is currently attempting to get a formal ruling on just what this means.

**..and China**

ACORN International is on the verge of signing an agreement with a company in mainland China to manufacture and distribute the BBC Micro.

"We are a long way down the line to signing a contract", said sales manager Owen Maddocks.

**Pet-BBC link**

OWNERS of Commodore Pets who want to change to a BBC Micro can now do so - and keep their old printers and floppy discs.

The trick is done with an interface - the Syscon 6 - which links the BBC Micro to Commodore disc units and printers.

It connects to the Beeb's 1MHz bus and auxiliary power connector. The DFS and printer driver routines are supplied in an eeprom which plugs into one of

the sideways ROM sockets.

And the standard BBC disc upgrade is not necessary.

**On-line Sprites**

BBC Micro and Electron users who have a Simonsoft Sprites animation package (version 2) now have a programmers' hot line on 0235 24140. All questions will be answered on this number between 2pm and 3pm weekdays.

LEGAL action is being threatened by *The Micro User* over an inaccurate claim made on behalf of Acorn User. The claim is made by Acorn User's advertising agents, Computer Marketplace.

It appears in a letter to advertisers, accompanying a brochure announcing a 17.6 per cent increase in Acorn User's advertising rates.

The letter states that even with the rate increase Acorn User "has a lower cost per thousand advertiser figure".

"This is nonsense",

**ACTION  
ON FALSE  
CLAIM**

said Derek Meakin, managing editor of *The Micro User*. "The truth is that Acorn User's advertising rate works out at £5.87 per thousand, while the rate for *The Micro User* is £4.38 per thousand.

"Instead of being cheaper, advertising in Acorn User costs a hefty 34 per cent more!"



# Teacher goes home to a Beeb

THE classroom computer teachers switch off at the end of the day is more often than not the same model they plug in when they get home... the BBC Micro.

Forty-six per cent of computer-owning teachers have a BBC Micro – twice as many as own the next most popular model, the Sinclair Spectrum – according to a survey conducted by Educational Computing, a leading computer journal in education.

And a similar percentage of prospective teacher-purchasers intend to buy the BBC machine.

The survey of 35,700 schools and colleges indicates that BBC Micros will account for nearly two-thirds of new educational computer

purchases during 1984.

It also uncovered the Beeb's consistently high standing across all types of institution – three-quarters of all schools and colleges have at least one, rising to a massive 84 per cent of colleges.

By comparison, RML's most popular model the 480 Z is used by 18 per cent of institutions and Sinclair's ZX-81 by 16 per cent.

Acorn managing director Chris Curry said: "The survey is important because it spans all types of schools and colleges.

"It results clearly demonstrate that the BBC Micro is the most impor-

tant computer in education today, and one that is proving to be as valuable a tool in universities and colleges as in primary and secondary schools".

The survey also confirms in part a Department of Trade and Industry report that 83 per cent of orders under their "Micros in Primary Schools" scheme are for BBC Micros.

## Make a micro quilt

THE BBC Micro is now being used to replace hours of tedious drawing and colouring-in by patchwork quilt designers.

Patchwork design – now a booming hobby in Britain – has countless evening classes, books and TV programmes devoted to its mysteries.

Hard line patchwork addicts are members of the 2,000-strong Quilters Guild. But there are also thousands of quilting freaks in local groups, and

still more working alone.

Each region of Britain has its own traditional patterns, with other designs coming in from Scandinavia and the USA.

Now a Hampshire quilter, Mary Hewson, has developed a package for the BBC Micro called Patbuild.

It lets the designer try out the effect of distortions, repetitions and various colour combinations – all in a fraction of the time it takes with pencil, ruler and felt tips.



SEVERELY disabled Mark Simmons, 19, has just been offered a full-time job as a systems trainee by Nottingham County Council.

Mark, a member of the

BBC Micro club at County Hall, started in computing last October.

He joined a government sponsored Threshold course run by Control Data Institute. Later,

after basic training in data processing and Cobol, he spent nine weeks in Nottingham County Council's management services department.

## PRESTEL HEADS FOR THE CLASSROOM

PRESTEL, the British Telecom viewdata service, is launching a new education service for schools – and the BBC Micro will be playing a leading part.

The Department of Trade and Industry, recognising the importance of information technology to schools, is helping to fund the new service.

Schools will be able to subscribe to all the regular Prestel features along with special educational microcomputing applications by converting

their micro into a Prestel terminal.

The service is aimed at Britain's 7,500 secondary schools – many of whom have selected the BBC Micro – and local education authority teachers' and advisory centres.

It has been developed with the Council for Educational Technology (CET) for the UK.

The Department of Education and Science-funded Microelectronics Education Programme, the Scottish Council for Educational Technology and other educational

organisations are also contributing to the new project.

The Prestel Education Service is due to start next January. Special features will include:

- School Link, an educational microcomputing service allowing schools to receive telesoftware programs direct from Prestel down the telephone line.

- Advice, support and ideas to enable schools to develop their use of information technology.

- Information on career opportunities.

## BOOST FOR MENTAL ARITHMETIC

IF you thought mental arithmetic for kids was a thing of the past, think again. Griffin Software is staging a rescue operation for youngsters who want to turn two plus two into four without using their calculators.

Available for use on the BBC Micro, Mental Arithmetic is a software package for over-eights providing practice in basic numeracy with two programmes, an individual test and a class test.

Between 10 and 20 questions can be selected in each test, with up to three levels of difficulty.

Three other new titles

for the BBC Micro from Griffin are aimed at helping students understand maths concepts often difficult to grasp in a classroom situation.

### Tested

Designed for students aged 10 to 16, the packages cover fundamental algebra, Pythagoras' theorem and basic trigonometry.

Each title has been written, evaluated and tested with the help of teachers, according to Griffin, and contains full instructions and record sheets to help monitor progress.

**£1,000  
software  
prize  
offered**

ners up in the contest will receive prizes of £200, £100 or cash vouchers.

There is no age limit, but under-18s must have a parent's signature.

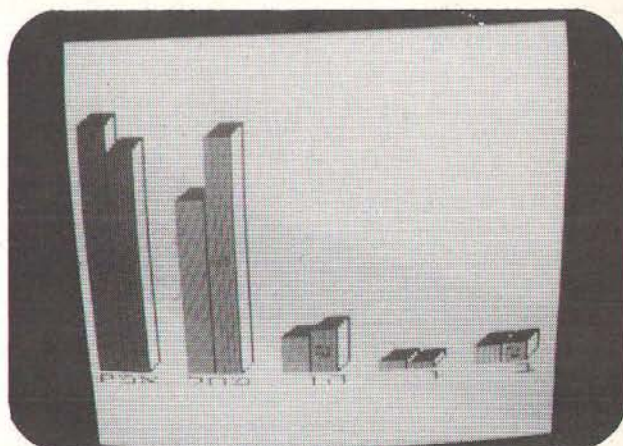
Entry forms are obtainable by sending a stamped, addressed envelope to County Computers, 13 Bucklersbury, Hitchin, Herts. Closing date is September 14.



# BBC Micro chosen to cover Israeli elections



*Beeb-produced map of Central Israel showing main cities and locations where a sample poll was to be taken*



*How Israeli viewers saw a bar chart of projected '84 results versus '81 results*

A HANDFUL of BBC Micros stole the show during Israel TV's marathon coverage of the country's election results.

They were used to bring up-to-the-minute election night details to a nationwide TV audience—and they were chosen for the job over other systems costing up to 10 times as much.

The BBC Micros were used in two ways.

Israel's top statistician wrote a program to analyse a sample poll at 35 polling stations on election day.

These figures were used to predict the outcome some five hours before the final results—with over 95 per cent accuracy.

Then the election results were translated into graphs and pie charts by a BBC Micro as they came in from a government mainframe.

The graphs were displayed to the TV audience to show the changing fortunes of the 27 parties as the night wore on.

In the search for the best computer to do the job, TV producer Rafi Ginat travelled to Europe and the United States. He was offered systems costing from £10,000 to £30,000.

But in London he found that the BBC Micro offered good colour graphics and data communications for a few hundred pounds. He learnt, too,

that BBC engineers had dreamed up a device to connect the BBC Micro to the video equipment used in TV studios.

And Hebrew software was available, because the micro is widely used in Israeli schools, as well as Jewish schools in the UK. It is exported to Israel by Aldoda Ltd of London and Tel Aviv.

Israeli companies use the BBC Micro for their business communications with Britain and the US.

With a BBC computer plus electronic mail service, companies and news services can save a hefty slice of their international phone and telex bills.

And in a related field, Israel Instructional TV uses BBC Micros with its teletext service, itself based on the BBC's Ceefax and ITV's Oracle.



*Hectic meeting between Israel Television and Aschola staff to prepare for election night*

## Micro soccer starts rumpus

THE cloistered peace of a respected academic institution was shattered recently when students nearly came to blows over a computer game.

They were playing Qual-Soft's soccer strategy game, "League Division One" as part of a computer appreciation course.

But these students also

happened to be apprentices from two rival football clubs, Swindon Town and Reading, on day release at Swindon College.

Passions ran high as the students argued the best strategy for the game, which simulates the problems of a football manager as he steers his team to the cham-

pionship.

Fists were clenched and voices raised as the youths split into opposing factions. Fortunately, reason prevailed before the threatened outbreak of soccer hooliganism.

The session ended in a spirit of friendly co-operation, with team spirit fully restored.

When contacted, a

spokesman for the college laughingly dismissed reports of a full-scale riot in the classroom. And according to lecturer Brenda Lawton, who choose the software, the soccer game was the high spot of the whole course.

League Division One is available for the BBC Micro and an Electron version is also due soon.



## Card offers complex colour displays

LATEST product from Cambridge Microcomputer Systems (CMS) is a high performance, low cost colour graphics card allowing 512 x 256 pixel resolution and an 85 x 32 character screen.

Shown for the first time at the show, the board, coupled with the CMS 6809 universal controller card, is designed to meet the increasing need for colour display of complex technical processes on the factory floor.

Said a spokesman for the company: "We envisage the software for the card being developed on a BBC Micro using our 6809 second processor.

### Simple

"The development system costs less than £500 and includes PL9, the ideal applications language for this type of product. It's fast, simple to learn and easily rommed".

The graphics board, complete with 64k DRAM, supports four colour planes, hardware vector and character generator and an internal light pen facility.

CMS also unveiled their IEEE Talker/Listener Controller and a 6502 version of their universal controller.

WEEKS of intense speculation and interest ended when Watford Electronics revealed their latest product—an add-on ROM/RAM card for the BBC Micro allowing up to 128 sideways ROMs to be added externally and 15 internally.

It was one of the star attractions at the July Electron and BBC Micro User Show, held at Alexandra Palace.

Called Apex, the minimum system consists an internal card for 15 paged ROMs—either 2, 4, 8 or 16k eproms.

With the Apex control ROM fitted 11 of the sockets can be configured for 8k RAM chips, giving in effect an 88k RAM disc.

The control ROM also allows the 128 extra sockets to be added via a ribbon cable and IDC

# WATFORD REVEAL THEIR SECRET

connectors in cards of 16 at a time, distinguishing between each external device either ROM or RAM. Filled entirely with RAM, the system supports over 1mbyte of memory!

Despite the power and complexity of the system, Apex uses only four zero page locations, having its own onboard 2k battery-backed workspace.

This means that ROMs requiring large amounts of private workspace should be on the internal board, whereas more

standard ROMs such as word processors can be part of the external system.

Apex uses power saving techniques to ensure that only the socket selected has current, so eliminating overheating.

The internal board can be fitted without any soldering, the card plugging into the 6502 and 8271 sockets.

The latter point was to enable the second of Watford's new products launched at the show to be fitted—a dual density

version of their DFS that will allow up to 360k storage on a single disc surface.

Based on the Western Digital 1770, the code features a complete 8271 emulator that allows the DFS to recognise and work with both single and dual density discs.

Watford will be allowing people upgrading to Watford 1.4 DFS, as it is known, to trade in their old, and rather scarce, 8271 chips, thus keeping the costs down to around that of the standard DFS.



A TRIO of 15-year-old girls who sacrificed their lunch breaks for a month to write a BBC Micro program had their self-inflicted hunger pangs rewarded when they were named as winners of a major contest.

For they provided the best electronic answer to keeping death off the roads in the Greater London Road Safety Contest sponsored by Database Publications.

Karen Dyerson, Angela Moran and Sarah Finucane—all fourth year pupils at Holy Cross Convent School, New Malden—put their heads together at noon each day to come up with "Big Feet", the winning entry.

Incorporating the slogan "When you

## Lunch break programs win road safety prize

Wanna Cross the Road Use the Green X Code", the program was selected as the outstanding example of how to use computer graphics to achieve maximum impact.

"We were most impressed with the quality of all the entries which came from schools throughout the Greater London area—but this one really stood out", said Alan McLachlan, a road safety expert and chair-

man of the judging panel.

The girls, accompanied by computer studies teacher John Downing, were guests at the opening day of the show where they were presented with a Pace disc drive as their prize.

"We were particularly delighted to have won because we have only had computers at the school for a year", said John Downing.

"What is even more pleasing to us is that we

are a secondary modern school hemmed in by two grammar schools in New Malden—and they didn't get a look in".

As a result of their success, Karen, Angela and Sarah have all decided to stay on at school to take computer science at A level.

Following the prize presentation by Derek Meakin, chairman of Database Publications, the girls were treated to a slap up lunch at the show.



# A big cat guards the Show star

AN exotic security operation was mounted when an internationally famed gold artefact, the "Jewelled Hare of Masquerade", was transported across London.

The £30,000 work of art was moved from a city bank vault to Alexandra Palace around the neck of a snarling jaguar – jungle wildcat variety. Once safely there it went on display during the four day Electron and BBC Micro User Show.

## Aussies were there

THE market for the BBC Micro is blossoming Down Under.

So much so that distributors from Australia and New Zealand flew in specially to attend the show to see for themselves the latest developments on the scene.

Said Sue Dyson, representing an Australian distributor: "Acorn have sold at least six to seven thousand BBC Micros in Australia and the

market's growing.

"However people feel frustrated that they can't readily obtain the products they see advertised in *The Micro User* – and until recently, even the ones that were imported were heavily taxed".

Such is the interest in New Zealand that distributors there are considering setting up their own UK company aimed specifically at exporting to the antipodean market.

## Safety interface

A VERSATILE interface module that's claimed to totally protect your BBC Micro from damaging "electrical feedback" was launched at the show by Pilot One.

The unit, which features four opto-isolated inputs and four 0.5 amp relay driven outputs is said to be

totally isolated from the BBC Micro – not even sharing a common ground line.

It also incorporates its own 5v 1 amp regulated power supply to drive projects without using the BBC Micro's own PSU.

The Pilot One interface, complete with software, costs £60.

## Winnie from Pace

NEWEST hard disc on the market comes from Pace, who used the show to launch their own Amcom Winchester drives.

Pace foresee a major application of drives acting as file servers for their E-Net system – a product that's already

creating great interest in educational circles.

Said managing director Barry Ruberry: "The nice thing is that E-Net uses standard Econet interfaces, so users who have Econet level one can upgrade to Amcom Winchester plus E-Net without any problem".



Girl with problems ... the Jewelled Hare and its guardian

## ENTER THE HARD ROCK BEEB

MUSICALLY minded BBC Micro owners will be able to compose music and then play it back over digital synthesisers thanks to a new interface from Electromusic Research.

Although synthesisers have long had a standard interface – the MIDI (Musical Instrument Digital Interface) – this could not communicate with the BBC Micro.

The Electromusic in-

terface will allow two way communication.

What this means is that with suitable software, not only can the BBC Micro owner compose music on his micro, but he can play a tune on a synthesiser and have the notes appear on his screen.

The system, which created tremendous interest when demonstrated on the City Music stand, sells at around £159.

## USE FOR THE ASHTRAY

ON sale for the first time at the show, the Viglen sideways ROM cartridge system proved to be a best seller.

The package allows you to plug sideways ROMs in and out of your BBC Micro at will, without having to open the case or turn the power off.

It works by running a ribbon cable from the sideways ROM sockets to another socket fitted in the "ashtray" to the left of the keyboard.



## Handicaps beaten by Beeb mike researchers

CHILDREN with speech defects are receiving therapy by playing voice-controlled games on the BBC Micro.

Joint research by Manchester Polytechnic and the North West Computer Club has come up with Micromike, a modified CB radio microphone used to control computer games of varying complexity.

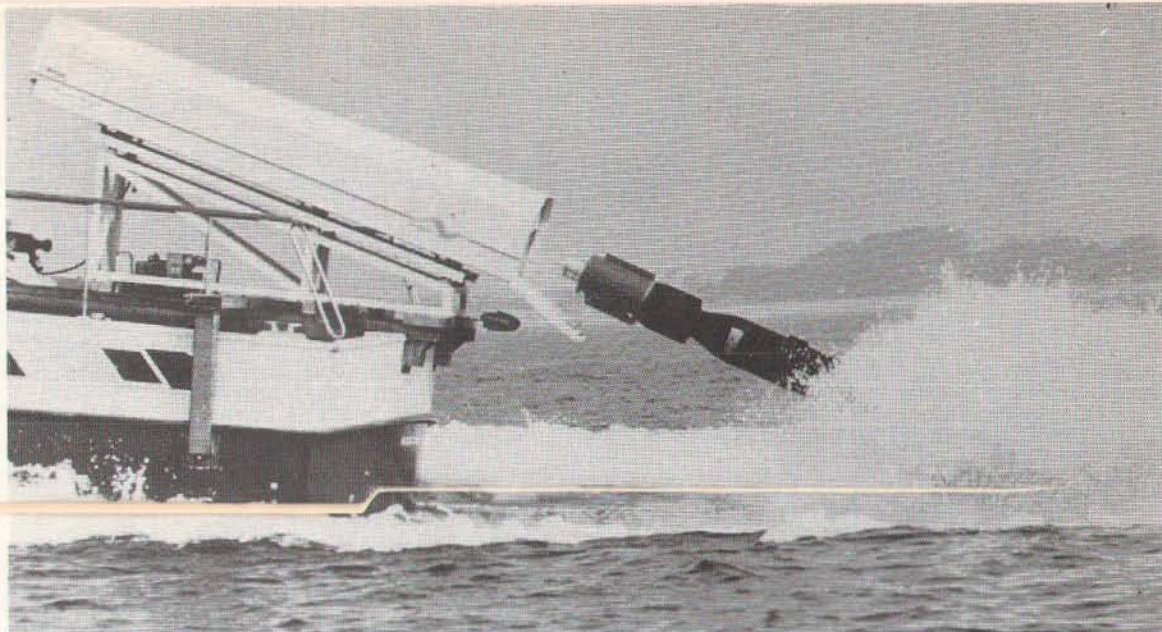
According to Bob Dyke of the Polytechnic's Special Education Micro Electronic Resource Centre (Semerc), some of the games are played through whispers and shouts.

Others are controlled by timing — for example, the player might have to cry "Shoot!" to zap an alien.

Other games are controlled by using certain vowels and consonants, so speech therapists can prescribe different games for different handicaps.

Micromike can be adapted to operate any single-key input program. Dozens of programs are available, and the device also comes in a desktop version for people who cannot hold a microphone.

Semerc is now working on an assortment of switches for the severely handicapped.



*Kingfisher ... the containerised compact Sting Ray launch system*

# Now BBC Micro gets its calling up papers!

THE BBC Micro is helping develop underwater weapons for the Royal Navy.

Defence contractor Marconi Underwater Systems uses it in the analysis of existing weapons and the development of future ones. This includes the latest torpedoes Sting Ray and Spearfish.

So far, Bedford-based Broadway Electronics has supplied four BBC Micros and associated

peripherals. They are used to create a computer link between Marconi factories in Wembley and Portsmouth.

More computers are to be installed and used in a network system.

Apart from day-to-day project management and scientific modelling, the equipment is used to analyse the forces and stresses which affect torpedoes during launch.

This involves a data logger which records the

position and velocity of the weapon.

This data is retrieved, using the BBC Micro and an ordinary commercial interface. Analysis is then carried out on the BBC Micro or the data can be transferred to a mainframe.

A Marconi spokesman said Broadway was the only company who offered a complete system including installation, commissioning and backup services.

Paul Vaughan, managing director of Broadway Electronics, said: "This illustrates the power of this well-known home computer. It also means we can be proud of offering industry a really in-depth service."

Broadway is part of the newly-formed Mushroom Computer Group, specialising in add-ons for Acorn and Electron computers for business, commercial and educational uses.

## The year of the mouse...

THIS year will be remembered as the year of the mouse, according to Nick Pearson, sales director of Advanced Memory Systems of Warrington.

His firm has devised a mouse for the BBC Micro which is being unveiled at the Electron & BBC Micro User show in Manchester at the end of August.

A mouse is a tethered electronic box that you roll over your desk like a Dinky toy. This action moves the cursor around the monitor screen of your micro.

The mouse also has push buttons for entering



commands.

Says Pearson: "A mouse is not just a nifty way of moving the cursor. It is more like light pens or bit pads than cursor keys. And it's amazingly easy to use".

According to Pearson, the mouse offers BBC users a whole new

approach to working with computers. It also offers them ikon technology.

Ikons are little graphic symbols which represent the services on offer from your micro.

For example, a picture of a filing cabinet represents a file, and if you point the cursor at a

picture of a waste bin, you can use it for getting rid of information you have finished with.

The AMS mouse comes complete with ikon software, but it also works with present BBC software, making it quicker and easier to use — especially for games and word processing.

The price is expected to be around £80, and Pearson is anticipating sales of between 1,000 and 2,000 units a month.

With first deliveries planned for October, he expects to supply 5,000 or more during the run up to Christmas.

## DISC DRIVE DOCTOR

DISC drive maintenance is now offered direct to all BBC Micro users by Alpha Disc of Egham, Surrey.

The company offers micro users a direct fixed price basic alignment and recalibration for their disc drives at £20, with the job completed in one week.

"Most drive failures are in this category", says director Jon Pavitt, "and we know how to deal with them simply and quickly."

"We suggest owners either take their faulty drive to their dealer and ask him to contact us, or send it direct to us in protective packaging".



# Beeb is flying high

A BBC Micro is at the heart of a prize-winning flight simulator program devised by a Manchester University lecturer.

Dr Bert Bloy, who teaches aeronautical engineering, won a £200 prize in a recent Royal Aeronautical Society contest for a cheap but realistic flight simulator.

It imitates a Cessna training plane, which the pilot controls with a joystick, plus two slide inputs for throttle and flaps.

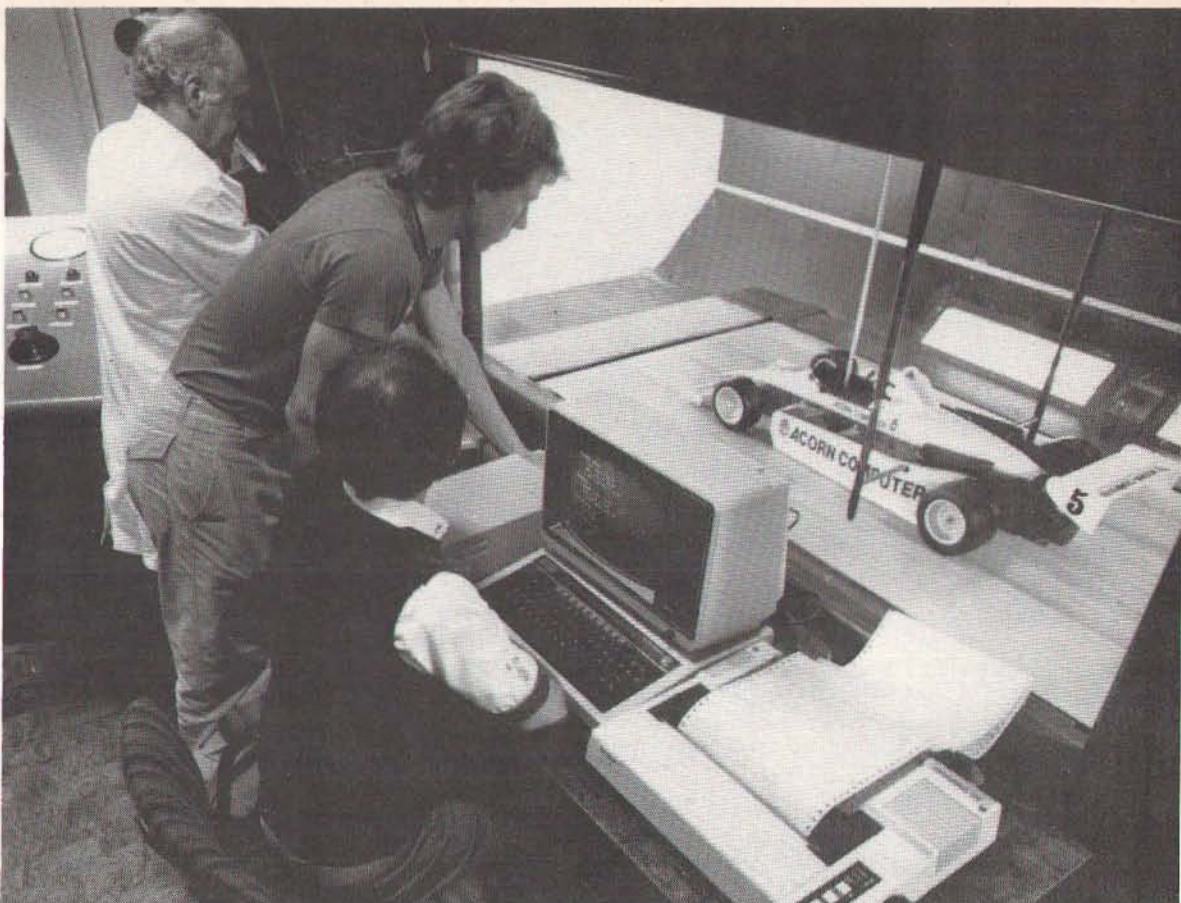
An unusual feature is that the joystick has built-in "feel". And the space bar can be used as a trimmer to take excessive fore-and-aft loads off the stick.

Instruments are artificial horizon, directional gyro and vertical speed indicator. Air speed and height are shown by digital readouts.

As an aid to landing green lights show the pilot when he is on the glide path, with a red warning light if he gets too low.

But Dr Bloy feels he still has some way to go before his program is perfected.

There is no rudder control as yet, and at present the program simulates landing only. "I am still working on it, and I hope to achieve a complete circuit soon, from takeoff to landing", said Dr Bloy.



## Acorn gets wind up

A BBC Micro is being used in wind tunnel tests at Southampton University to improve the performance of aircraft, racing cars and other motor vehicles.

Benefiting most recently from this facility was Acorn's own Formula 3 Ralt racing car which is driven by David Hunt, younger brother of former world champion, James Hunt.

The wind tunnel enables engineers to measure the aerodynamic

forces operating on the racing car.

To simulate normal race circuit air conditions a 200 horse power fan blows air over a detailed one-third scale model of the car, while a moving belt under the wheels simulates the ground effects of travelling at speed.

### Significant

As a result of the wind tunnel testing Acorn expects to achieve a 40 per cent improvement in

the aerodynamic design of the car which should result in a significant increase in speed and cornering potential.

Work on the Acorn car at the University's Department of Aeronautics' wind tunnel will continue into the season alongside work for the Brabham Team which won the recent Formula One Grand Prix in Detroit and Montreal in the hands of current world champion Nelson Piquet.

## Pirates get their cards

RISING Edge Data (RED) has patented and started making a system they claim will stop software piracy.

The system uses a card like a credit card which is magnetically coded with key data, different for each program.

A card will be given away with the program, which will not run without it.

The other half of the system is a card reader initially available for the BBC, Spectrum, Commodore 64 and Atmos. This can be left plugged into the back of the micro. Other add-ons plug into the back of it.

The cost of the card reader will be on a par with the average price of software, although some companies may decide to give away the reader as a special offer.

The advantages to the end user might include a fall in the price of software when the manufacturers increase their sales.

## LANGUAGE SERIES IS EXTENDED

FOUR new titles for the BBC Micro have been announced by Acornsoft, the software publishing side of Acorn Computer.

They are S-Pascal, Turtle Graphics, Lisp Demonstrations and BCPL Calculations.

S-Pascal, a subject of the popular programming language Pascal, has been specially developed for education.

It compiles directly to 6502 machine code and is said to be ideal for writing small, fast utilities. Library routines allow use of

graphics and access to operating system commands.

Turtle Graphics offers the turtle drawing commands of the Logo language, making an introductory package for teaching elementary geometry, maths and graphics.

### Patterns

The "turtle" is an imaginary creature. Controlled by the user, it moves around the computer screen leaving a visible trail from which

patterns are built up.

The Turtle Graphics interpreter supports a subset of full Logo, sufficient to construct quite complex programs with arithmetic operations, loops, procedures and keyword abbreviation.

Lisp Demonstrations contains a set of 11 easy-to-use example programs written in the artificial intelligence language, Lisp.

Applications include computer graphics, the compilation of computer

languages and artificial intelligence.

BCPL Calculations comprises a set of calculation files and example programs for use with Acornsoft's BCPL language system.

Three sets of calculation procedures are provided - floating point, fixed point and fast integer - to meet a wide range of applications.

Prices range from £10 to just under £20. All except BCPL Calculations are available on disc.



# Acorn poised for boom

A ROSY future for Acorn is forecast by stock-brokers Henry Cooke, Lumsden and Co, who recently hosted an information technology forum at the National Computing Centre.

They say Acorn's pre-tax profits for 1984 should be around £11 million. Next year the figure is likely to rise to between £15 and £20 million.

In an eight page review, HCL analyst James Warhurst forecasts good general progress for Acorn, but puts a question mark over the future of the BBC Micro's assault on the US education market.

"Without the backing of a large US corporation and against powerful indigenous competitors, the chances of success are limited", says Warhurst.

But he sees better prospects in developing countries, notably India.

In European markets he highlights Germany and Spain as the best likely customers for educational products.



Inside one of the mobile classrooms

# Micro goes on tour

THE BBC Micro is being taken on a tour of the country to meet the computer sales staff of W.H. Smith.

The firm found it impossible to train its nearly 1,000 computer salespersons at its Oxfordshire staff college, so it has equipped two £30,000 mobile classrooms to do the job.

# Walk right in for all the answers

BBC Micro fans in the North will have a chance to quiz the experts at a walk-in forum in Manchester.

It's just one of the star attractions at the North's own Electron and Micro User Show, now back at the Renold Building, UMIST, Manchester.

The show runs from Friday, August 31, to Sunday, September 2.

As well as getting to see everything that's new in hardware and software for the BBC Micro and Electron, you'll be able to hear talks by the writers whose articles you read in

## The Micro User.

You won't need an appointment or a special ticket—just wander in and sit down. It's an ideal opportunity to listen to the experts—and to join in the fact-filled question-and-answer sessions.

## Launch

Scores of firms will be displaying their new products—many for the first time in public.

Everything on show

will be for sale—often at special low show prices.

Latest to announce a launch at the show is a Warrington firm which has developed a mouse for the BBC Micro.

And the Department of Trade and Industry will be on hand with its travelling Information Technology road show.

All in all, it promises to be a rewarding day out for all BBC Micro and Electron users.

FOLLOWING the Manchester event, two more Electron and BBC Micro User Shows are being held in London this year.

We return to Alexandra Palace for our big autumn spectacular from October 25 to 28, which will see the unveiling of lots of new products.

Then it's back to the New Horticultural Hall in Westminster for our Christmas show, from December 6 to 9.

And more shows are now being planned for next year to satisfy the ever-growing demand.

# BARRY WOOD'S TAILPIECE

I WOULDN'T say that Andrew Bray—the whiz kid who wrote the Watford DFS and part of the Advanced User Guide—has made a lot of money out of it, but rumour has it that he's just started an accountancy course in order to keep track of it all...

\*\*\*

TALKING about Watford, one of the puzzles of our Alexandra Palace show was solved for me by Kevin Edwards, newest recruit to our Technical Advice team.

Why, I wondered, would anyone want to have Watford's new system that allows you 128 sideways ROMs in a single board?

"Easy", said Kevin, "it's so you can have all the versions of the

Watford DFS in one micro".

\*\*\*

BEST question of the show as far as the Technical Advice Stand lads were concerned was the anxious: "What exactly is this Mode M you lot keep going on about?"

\*\*\*

MIKE Cook was the star of the Technical Advice Stand once more. I really must scotch those vile rumours that all the exposure has gone to his head—he's still the same unspoiled lad who'd sell his autograph to anyone.

Mind you, I think he's out of favour with our beloved features editor, who was heard to mutter, as he collapsed

exhausted in the hotel bar, "All that body building, and he still can't carry his own luggage".

\*\*\*

WHILE on the subject of the features editor, he took us all by surprise by shaving his beard off just before the show.

At first we thought it was so he could have his photo in the magazine like Mike Cook. Then we decided it was so that people who unwisely took his advice at the last show wouldn't recognise him when they came to exact retribution at the latest event.

All was revealed, however, when he offered to buy a round of drinks for us.

Then we realised why he'd done it. He looks so young and fresh-faced

without the fungus the barman refused to serve him!

\*\*\*

NOTICE how the old squirrel abuser has been gaining great satisfaction from pornographic software recently?

The only thing he failed to reveal is that it has been rommed—courtesy of a non-pseudo user group. And how do you call it?

\*FACORN, of course!

\*\*\*

WELL, Imagine have gone the way of all flesh, and I think I know why.

Remember all those stories in the press and on TV about 18-year-old kids driving Jensens and earning £35,000 a

year?

It's obvious, they were so busy giving interviews they never had time to write any programs...

\*\*\*

I WOULDN'T want to imply that the squirrel factory are threatening legal action against a lot of people, but one of their programmers has revealed they're working on a ROM-based writ generator.

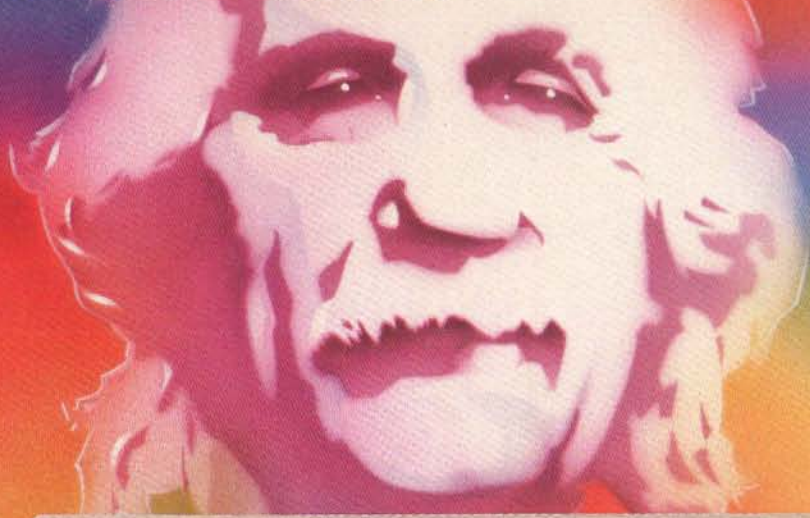
\*\*\*

I NOTICED the mag for squirrels has done it again. Last time they printed two blank pages, this time they've remembered the listing, but they've printed it upside down.

It was headed: "How to correct program listings".



# A COMPLETE COLOUR MICRO WITH NO HIDDEN EXTRAS FOR AROUND £499.



The title of 'genius' is not bestowed lightly on man or machine: those extraordinary qualities and powers of intellect are rare.

Einstein had them in full measure. And so now does the new micro computer from Tatung, designed and built in Britain and appropriately named - Einstein.

Einstein was created by Tatung, one of the world's leading electronic companies, and given the capacity and the remarkable capabilities to compete with computers costing far more.

Its simplicity of operation will appeal to the first time buyer and to businessmen who don't want to lose staff to expensive and time-consuming training courses. At the same time its operating system is both powerful and sophisticated to satisfy the most advanced requirements.

For those who have outgrown their existing primitive machine, the speed and capacity of the 500K built-in disc drive will make all the difference. And for the small businessman, the ability to store and retrieve all information in seconds will be as important as Einstein's built-in flexibility, which allows the system to grow with the business develops.

**BUILT-IN 80K MEMORY**  
Total memory capacity 80K RAM divided into 64K 'user' memory and 16K for colour graphics production.

**BUILT-IN DISC DRIVE**  
500K 3" compact floppy disc drive. Potential for massive extra storage with a second 500K disc drive internally.

**BUILT-IN 16 COLOUR GRAPHICS** High resolution graphic animation from 32 sprites (definable shapes), 16 vivid colours.



## BUILT-IN EXPANSION PORTS

Connection to both TV and optional colour monitor, most printers and other computers via RS232C interface. Also twin joystick ports, 8 bit user port, exclusive Tatung Pipe.

## BUILT-IN FLEXIBILITY

Powerful Crystal BASIC. Multi-lingual plus ability to run CP/M.†

## BUILT-IN VERSATILE SOUND

Sound synthesiser facility includes chromatic music with three voices. Substantial speaker with volume control. Provision for speech synthesiser.

Einstein has them all. Feature for feature, it meets the needs of the novice and the experienced operator, both at home and in the office.

Einstein, designed and built in Britain, is a complete colour micro computer with no hidden extras.

And for under £500 is sheer genius.

**TATUNG**

# Einstein

**SHEER GENIUS: AT WORK, AT HOME.**

DIAL 100 AND ASK FOR FREEFONE EINSTEIN FOR YOUR NEAREST STOCKIST.

†CP/M is a trade mark of Digital Research Inc.



# Rebalance this sh

The BBC Micro can now give an astonishing new account of itself.

Because with Acornsoft's new 16K ViewSheet ROM, it develops a head for figures which can save you a vast amount of arduous brainwork.

Imagine, for instance, that you had to make several adjustments to a balance sheet.

If you made those adjustments on ViewSheet, it would revise the balance automatically in a split second.

Or imagine that you had to add 15% VAT to every figure on a price list containing 500 items.

ViewSheet can add the tax to each and every one of those items simultaneously. And once again, in virtually a second.

As simple as pencil and paper.

ViewSheet is a computer-based spreadsheet, the figure processing version of a word processor.

With 255 columns in width and 255 rows in depth, it's also one of the largest spreadsheets on the market.

Originating the sheet is as easy as originating an ordinary worksheet with pencil and paper.

Because ViewSheet comes with an easy-to-follow reference card.

It enables even the most inexperienced users to feed all the data they need to use, and store on disc or cassette, into the BBC Micro.

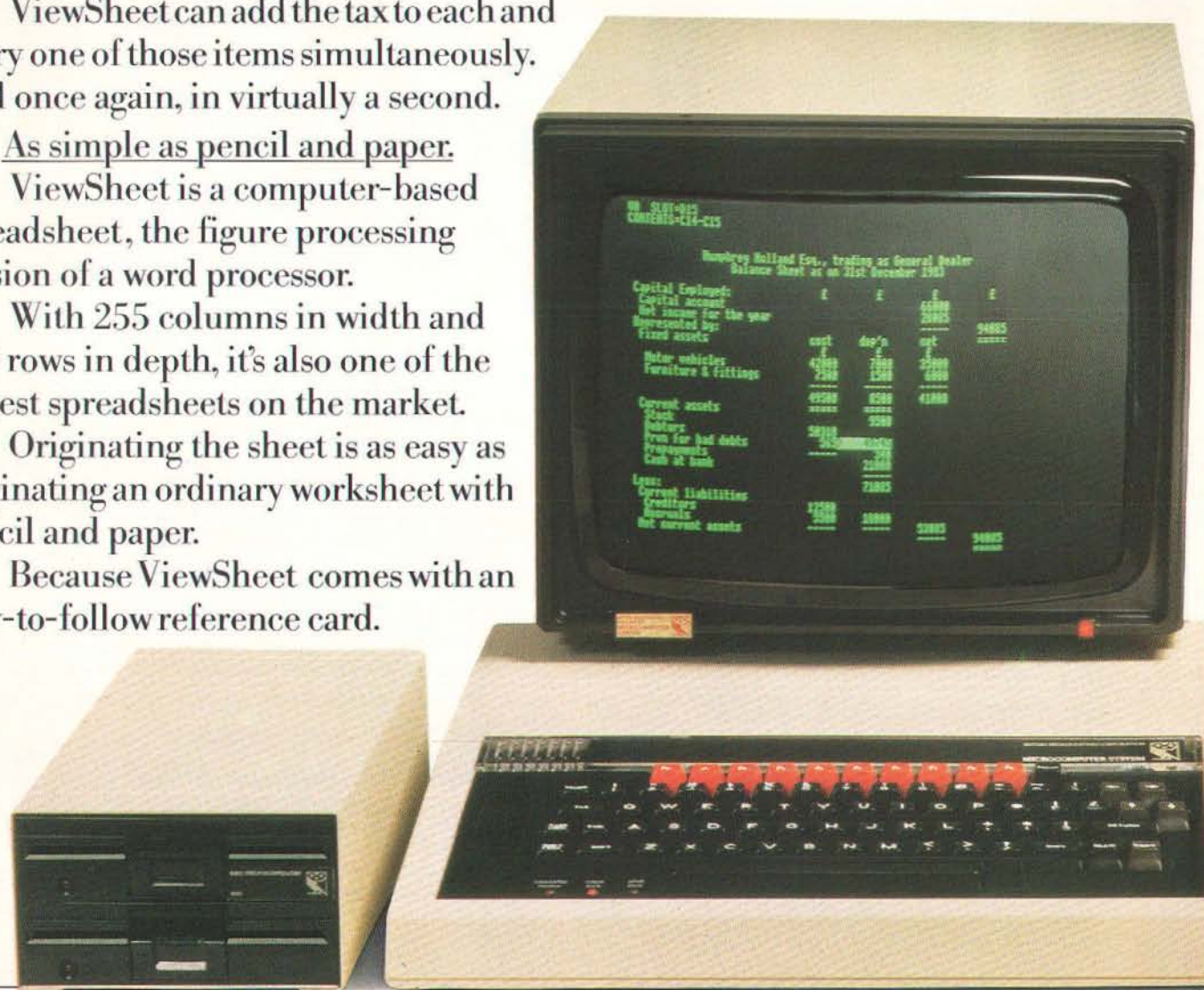
You can nominate headings and sub-headings. And you can create barcharts to display figures graphically.

Ten windows for perfect vision.

The sheer size of ViewSheet makes it impossible for the whole sheet to be visible on the monitor at once.

That's why ViewSheet has ten windows, enabling you to see up to ten different sections of the sheet at any one time.

You can summon the windows onto





# Sheet in one second.

the screen at the press of a key.

You can cross-reference sections, or even reposition them on the sheet, whenever you need to.

And you can print them out individually, as well as all together.

The possibilities are virtually endless.

By creating special disc files from ViewSheet, you can link two or more spreadsheets together. This means you can build models much bigger than the BBC Micro's considerable memory.

ViewSheet is also compatible with Acornsoft's View word-processing package. This enables you to produce reports and documents which combine text and figures.

In addition, you can use ViewSheet in any screen mode,

making the most of the BBC Micro's potential. And if you use it with the 6502 second processor, you'll have no less than 30K of workspace in any mode.

For only £59.80,  
you too can have figures like this.

The ViewSheet ROM can be fitted by your BBC Micro dealer in less than three minutes. And with its straightforward user guide, function

key card and reference card, it'll soon have you juggling figures at lightning speed.

Indeed, at only £59.80, it's an invaluable asset for anyone involved in professional or personal finance, forecasts, formulae and analysis.



#### ViewSheet's operations and functions in brief.

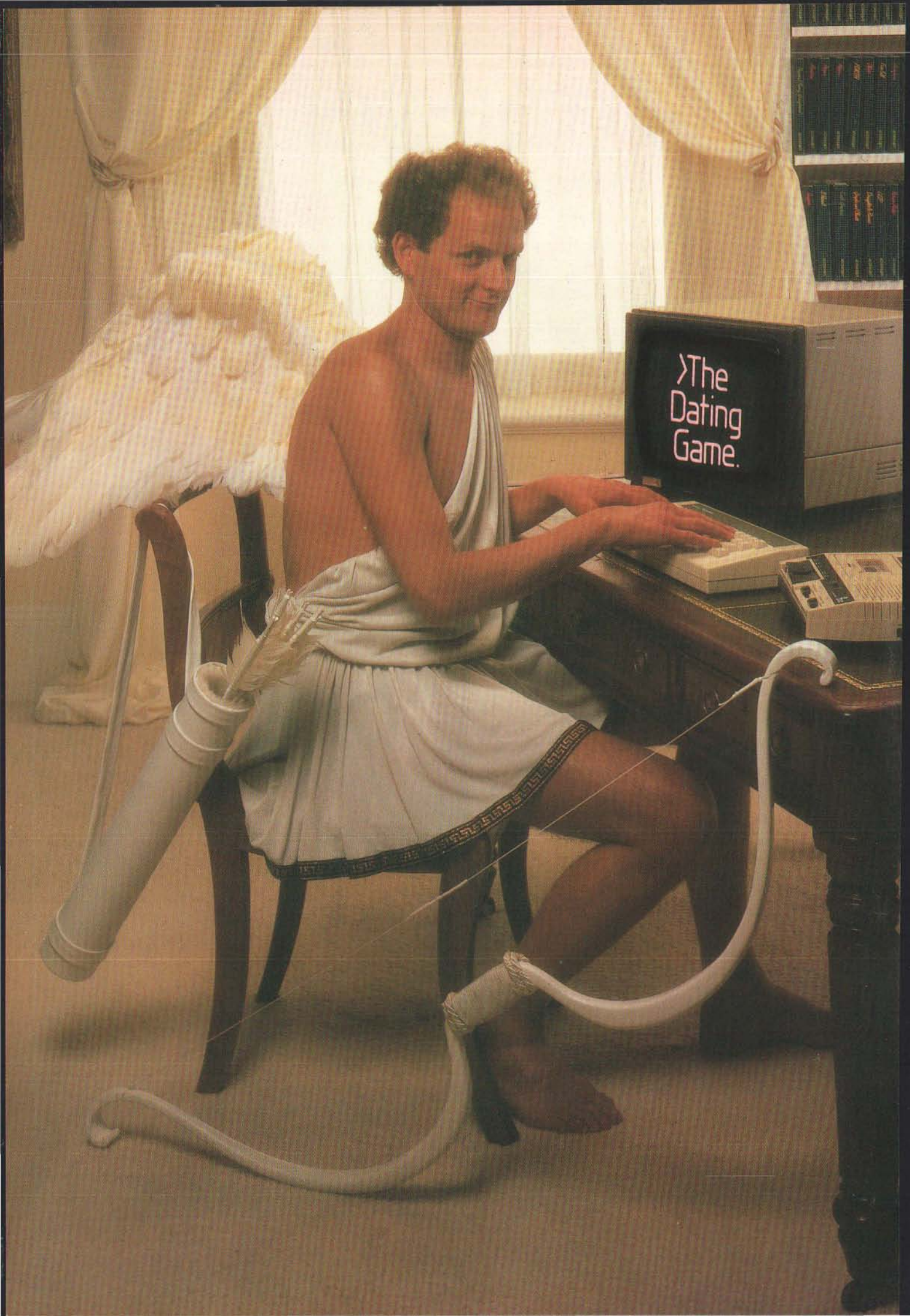
The operations supported by ViewSheet are: addition, subtraction, multiplication, division, exponentiation and bracketed operations.

And the functions supported are: ABS, ACS, ASN, SIN, SGN, RAD, ATN, COS, DEG, EXP, INT, LN, LOG, PI, SQR, TAN, MIN, AVERAGE, MAX, CHOOSE, LOOKUP, COL, IF, READ, ROW and WRITE.

## ACORN

c/o Vector Marketing, Denington Estate, Wellingborough,  
Northants NN8 2RL. Tel: 0933 79300.







# The Electron has added even more strings to its bow.

The list of top quality software for the Acorn Electron is growing all the time.

As you can see, there's already an outstanding selection of exciting programs covering everything from monsters to music and murder to marriage guidance.

And ultimately, the Electron will enjoy a range of software as comprehensive as that of its illustrious big brother, the much-acclaimed BBC Micro.

You'll find all the programs featured here at your local Acorn stockist. (To find out where that is, simply call 01-200 0200.)

Alternatively, you can send off for the Electron catalogue and order through the post by writing to Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL. Tel: 0933 79300.

GRAPHICS: Graphs & Charts, Creative Graphics, Picture Maker.

BUSINESS: Personal Money Management, Desk Diary.

EDUCATION: Tree of Knowledge, Peeko-Computer, Business Games.

LANGUAGES: LISP, FORTH, S-Pascal, Turtle Graphics.

GAMES: Starship Command, Monsters, Chess, Draughts and Reversi, Snapper, Meteors, Hopper, Sphinx Adventure, Arcadians, Free Fall.

QUIZZES: Theatre Quiz, Crime and Detection Quiz, Music Quiz, History Quiz, Science Fiction Quiz, '...I Do', The Dating Game.

CHILDREN'S EDUCATIONAL SOFTWARE: Happy Numbers, Timeman One, Timeman Two, Wordhang, Happy Letters, Map Rally.

**ACORNSOFT**





# Watford Electronics



Dept. BBC, CARDIFF ROAD, WATFORD, HERTS. ENGLAND.

Tel: Watford (0923) 40588/37774 Telex: 8956095 WAELEC

ACCESS ORDERS Tel: (0923) 50234



**SPECIAL  
OFFER**

## BBC Micro (Model B)

**New Low Price**

**£326**

Price includes  
a **FREE** Data Recorder  
PLUS five software  
programs worth £80.  
(At Watford we give you a  
great deal for your money)

6502 2nd PROCESSOR **£175**  
Z80 2nd PROCESSOR **£262**

### Dust Cover for BBC Micro

Protects your expensive Micro from foreign  
bodies. **£3.50**

## SEIKOSHA GP100A PRINTER

10" Tractor Feed, 80 columns, 50CPS.  
Normal & Double width Char, Dot res  
graphics. Parallel Interface standard.  
SPECIAL OFFER Only: **£144** £7 carr.)

### FRICTION FEED

Attachment for GP100A or 250X Printers **£28**

**GP-700** Colour Printer Screen-dump routine  
in ROM FOR BBC Micro **£12**



**EPSON**

**RX80**

100 CPS, 9 x 9 matrix, dot addressable  
graphics, condensed and double width printing.  
Normal, Italic and Elite Graphics. Tractor feed,  
10" max width, bi-directional, logic seeking.  
Centronics Interface standard.

**ONLY £229 (£7 carr.)**

## EPSON RX80 F/T PRINTER

As above but has both Friction and Tractor  
Feed. **£245.00 (£7 carr. Securicor)**

### PRINTER INTERFACE BUFFER

Neatly packaged self contained box,  
supplied complete with all leads,  
manual and detachable power supply.

Price: 16K Unit **£115**  
Price: 48K Unit **£149**

## Epson FX80 Printer

160 CPS, 11 x 9 matrix, proportional spacing,  
superscripts, subscripts, dot addressable graphics.  
Normal, Italic and Elite characters. Up to 256  
user definable characters. Down loadable  
character set. Condensed and double width  
printing. Full proportional spacing. Four user  
defined margin positions. Tractor and Friction  
feed. 10" maximum width Bi-directional, logic  
seeking Centronics interface standard.

**ONLY £319 (£7 carr.)**

Type	Ribbons	Dust Covers
MX80FT	<b>£4.75</b>	<b>£4.50</b>
MX100/FX100	<b>£10.00</b>	<b>£5.25</b>
FX80	<b>£4.75</b>	<b>£4.95</b>
RX80	<b>£4.75</b>	<b>£4.50</b>
GP80	<b>£4.50</b>	<b>£4.50</b>
GP100	<b>£4.95</b>	<b>£3.95</b>
GP250	<b>£5.95</b>	<b>£3.95</b>
GP700	<b>£18.50</b>	<b>£3.95</b>
KAGA KP810	<b>£5.95</b>	
CANON PW1080	<b>£5.95</b>	

## RX & FX PRINTER INTERFACES

RS232	<b>£35</b>	RS232 + 2K Buffer	<b>£59</b>
IEEE 488	<b>£65</b>	2K Parallel	<b>£58</b>

## BROTHER HR-15 DAISY-WHEEL PRINTER

An exceptionally high quality daisy wheel printer  
at the price of a dot matrix printer. 18CPS;  
bi-directional, 3K of buffer; has clear buffer  
facility, carriage skip movement, proportional  
spacing; underlining; bold print and shadow print.  
Prints in two colours; super and subscript facility.  
Impact control facility to vary pressure on paper  
for making carbon copies. Has Centronics parallel  
or RS-232 interface. Connects directly to BBC  
Micro. A ribbon cassette plus a separate red  
ribbon. Optional extras: single sheet feeder takes  
up to 150 A4 sheets; a keyboard that transforms  
HR15 into a sophisticated electronics typewriter.  
Attractively finished in beige.

**ONLY £349**

Single Sheet Feeder **£199**  
Keyboard **£150**  
RIBBONS: Carbon **£3**; Fabric **£3**;  
Multistrike **£6**

## LISTING PAPER (Plain)

1,000 Sheets 9 1/2" Fanfold Paper	<b>£7</b>
2,000 Sheets 9 1/2" Fanfold Paper	<b>£13</b>
1,000 Sheets 15" Fanfold Paper	<b>£9</b>
Teletypewriter Roll (Econo paper)	<b>£4</b>

## PRINTER LABELS

(continuous stationery)

1,000 90 x 36mm	<b>£5.50</b>
1,000 90 x 49mm	<b>£7.75</b>
1,000 102 x 36mm	<b>£6.25</b>

Carriage on Printer Paper or Labels **£1.50**

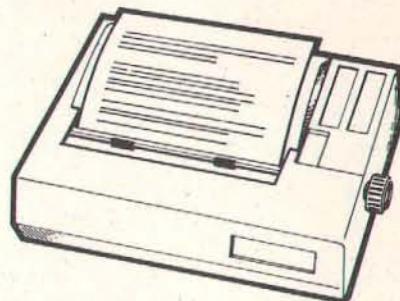
## BBC Micro WORD-PROCESSING PACKAGE

A complete word processing package consisting  
of: BBC Model B, Zenith 12" Green or Amber  
Monitor, Twin 200K highly reliable (1 year  
warranty) Cumana Disc Drives in matching beige  
colour, the popular WORDWISE word processor,  
Watford's own highly sophisticated 62 File DFS  
interface fitted, world renowned Brother  
HR 15 Daisy Wheel Printer, Gemini's  
BEEBCALC Spreadsheet Analysis, MAILING  
LIST and DATABASE Softwares on Disc. 10  
blank 3M Discs (Lifetime warranty). A 4 way  
mains distribution socket.  
10 blank diskettes, 500 sheets of fan-fold paper,  
Manuals and all the leads. To enable you to carry  
your Micro around, we shall pack it in our  
Antique Brown leatherette Attache carrying case.

**ONLY £1,199 (carr. £15)**

(P.S. We will alter the package to suit your  
requirement. Call in for a demonstration).

## KAGA KP810



This new JAPANESE printer has EPSON FX/RX  
compatible commands. 140 CPS Dot matrix  
Printer, offers **NEAR LETTER QUALITY** print  
in a 23 x 16 dot matrix in addition to the  
standard Epson style type-faces on the 11 x 9  
matrix. Friction feed, Adjustable tractor feed,  
Single sheet feed and built-in Paper Roll Holder.  
Normal, Italic, Enlarged, Condensed, Super and  
Subscript, Dot addressable graphics (8, 9 and 16  
pin modes). Proportional spacing. (Optional extra:  
Down loadable character set in 8K ROM or  
RAM). **NEAR LETTER QUALITY** print, selectable  
at switch on. 10" maximum width, bi-directional,  
logic seeking. 3K Buffer. Half speed quiet mode.  
Convenient Paper-out sensor switch. Centronics  
Interface standard. All this plus our no quibble  
12 months warranty.

Special Introductory Offer: **ONLY £249**  
RS232 Interface + 2K Buffer **£89**

## KAGA KP910 PRINTER

Similar features as the above KP810 printer but  
has extra wide carriage. Will accept up to 17"  
maximum width paper. 156 column normal and  
265 column condensed.

**ONLY: £349**

## PRINTER LEAD 36"

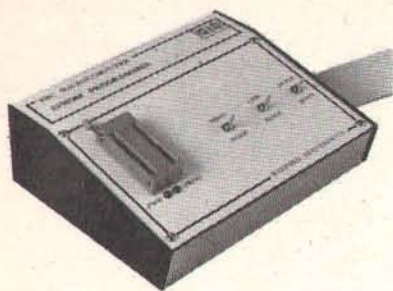
Ready made printer lead to interface BBC Micro  
to EPSON, SEIKOSHA, NEC, STAR, JUKI,  
BROTHER, SHINWA, CANNON, KAGA, or any  
Centronics Parallel Printer.

**ONLY £7**

Special Extra long 5 feet Cable **£10**



## EPROM PROGRAMMER



At last! — the EPROM Programmer for BBC Micro Computer from WATFORD ELECTRONICS

that will suit both your pocket and all your requirements. Programs all popular types of EPROMs from 2K bytes up to 16K bytes — 2716 — 2516 — 2532 — 2564 — 2784 — 27128. Our Programmer has been designed to make sure the EPROMs are neither programmed too fast nor too slow; just at the right speed as recommended by the manufacturers of the EPROMs (any deviation in timings can burn their brains out).

This extremely powerful system is designed for your needs of TODAY & TOMORROW! — BBC Basic programs can be copied into EPROM and subsequently re-loaded faster than from a disc! Suitable for both hobbyist and professional users!

Just look at these features:

● **COMPLETELY SELF CONTAINED** — Housed in its own sturdy case — Uses its own power supply — connects directly to the 1MHz Bus — Simple and Safe!

● **FULL SOFTWARE SUPPORT** — Comes complete with simple to use fully machine code ROM based software and easy to understand manual. Facilities include Verification, Reading, Virgin Testing, Writing, Editing, Saving, Loading and more! NOTE!! — This software does not simply comprise hastily prepared routines to get you going, but is a professional, purpose designed applications package.

● **ACORN BUS COMPATIBLE** — Use of the 1MHz connection complies with all Acorn addressing recommendations — That means you can still add-on such things as the TELETXT, IEEE 488 TUBE and PRESTEL

● Allows more than one program to reside in an EPROM using the ROM Filing System.

ONLY £79 incl. Manual (£3 carr.)

## TEX EPROM ERASERS

EPROMs need careful treatment to survive their expected lifetime. Rushing it could burn their brains out. So cop-out of this helter-skelter world; take it easy the TEX way and give your chips a well earned break. Cool, gentle and affordable. EPROMPT does it properly.

Two versions available:

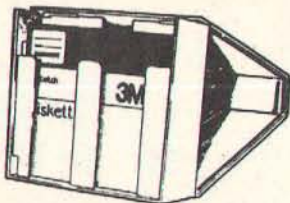
● **EPROMPT EB** — The standard version.

Erases up to 16 chips. £28.00

● **EPROMPT GT** — Erases up to 28 chips. Has an incorporated safety switch which automatically switches off the UV lamp when the Eraser is opened. £30.00

Spare 'UV' Lamp bulbs. £9

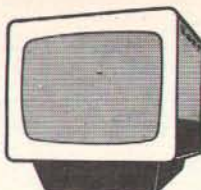
## NEW DESIGN PLASTIC LIBRARY CASES



for Disc Storage 5¼" (holds 10) £2

## MONITORS

● **MICROVITEC 1431**  
14" Colour Monitor, RGB  
Input. (as used in BBC  
programmes) FREE Interface  
Lead. ONLY £173



- **MICROVITEC 1451**  
Hi-res 14" Monitor incl. lead £295
- **MICROVITEC 1441** Super Hi-res  
14" Colour Monitor £249
- **KAGA 12"** Standard resolution colour  
MONITOR/COMPOSITE VIDEO ONLY £195
- **KAGA RGB 12"** Medium  
Resolution Colour £195
- **KAGA RGB 12"** High Resolution Colour £259
- **BNC** Connecting Lead £3
- **RGB** Connecting Lead £5
- **ZENITH 12"** High resolution, jitter free  
picture, Amber or Green £75

Carriage on Monitors £7 (Securicor)

## 5¼" DISKETTES

(Lifetime warranty)

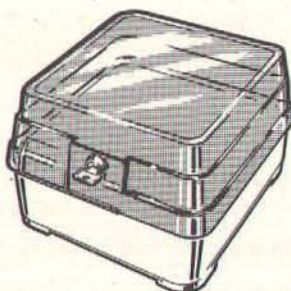
Why settle for less, Buy the best.

- 10 SCOTCH 3M Diskettes S/S S/D £15
- 10 SCOTCH 3M Diskettes S/S D/D £17
- 10 SCOTCH 3M Diskettes D/S D/D £28

## DISC ALBUMS

Attractively finished in beige leatherlook vinyl. Stores, protects and displays 20 discs in double-sided clear view pockets. ONLY £4.25

## LOCKABLE STORAGE UNITS



Attractively finished, strong beige plastic base fitted with dividers. Smoke acrylic top. Supplied with adhesive title strips for ease of filing.

- **M-35** Holds upto 35 mini discs £13
- **M-85** Holds upto 85 mini discs £18

## FLOPPY HEAD CLEANER KIT

Unless your Office/Home is dust free, you should clean floppy-heads at least once a week to avoid the risk of cross contamination. Very simple to use. Only £14

## MONITOR CRT SCREEN CLEANING KIT

The anti-static spray controls dangerous static charges on the screen surface and ensures its optical clarity. £12

## KEYBOARD CLEANING KIT

£16

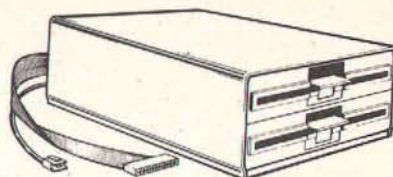
## PRINTED CIRCUIT BOARD CLEANING & LUBRICATION KIT

£14

## DISC DRIVES CASED WITH CABLES (less PSU)

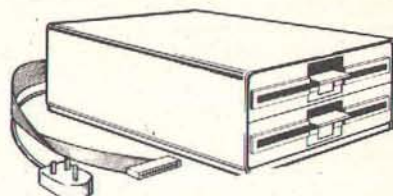
(All Drives are NEW SLIM-LINE Type)

## NEW LOW PRICES



- **CLS 100** Single, TEC Single sided 40 track  
100K, 5¼" Disc Drive £115
- **CLS400** Single, Mitsubishi Double sided 80  
track 400K, 5¼" Disc Drive £165
- **CLS400S** Single, Mitsubishi Double sided  
40/80 track Switchable, 400K, 5¼" Disc Drive £199
- **CLD200** TEC Single sided 40 track 200K,  
twin 5¼" Drives £225
- **CLD800** Mitsubishi Double sided 80 track  
800K, 5¼" TWIN Drives £325
- **CLD800S** Mitsubishi Double sided 40/80  
track switchable, 800K, Drives £249

## (CUMANA) DRIVES CASED WITH PSU & CABLES



- **CS100** TEC Single sided 40 track 100K 5¼"  
Single Disc Drive £139
- **CS200** TEC Single sided 80 track 200K 5¼"  
Single Disc Drive £205
- **CS400** Mitsubishi Double sided 80 track  
400K 5¼" Single Drive £225
- **CD200** TEC Single sided 40 track 200K 5¼"  
TWIN Disc Drives £245
- **CD400** TEC Single sided 80 track 200K 5¼"  
TWIN Disc Drives £365
- **CD800** Mitsubishi Double sided 80 track  
800K 5¼" TWIN Drives £425
- **CD800S** Mitsubishi Double sided 40/80 track  
Switchable 800K TWIN Drives £465
- **SPARE DRIVE CABLES, SINGLE £6; DUAL £8**
- **DFS Manual (comprehensive) £7.50 (No VAT)**

P.S.

1. You do not require Formatting Discs when using our DFS as the formatting program is in the ROM, nor do you require expensive 40/80 track switchable drives as with our DFS you can read and write both 40 and 80 track discs in an 80 track drive (software switchable).

2. Our **MITSUBISHI** Slimline Disc Drives are Double Sided, Double Density, 1 Megabyte. Track density 96 TPI, track to track access time 3mSec. They are fast, efficient and highly reliable.

Continued



## MK 2 13 ROM SOCKET EXPANSION BOARD

Now all lines fully buffered – On board battery back-up facility – will now accept EPROMs 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.

Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. This board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, etc. (At Watford, we think ahead.)

Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own. All lines are fully buffered and the Board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

Supplied ready-built and tested complete with fitting instructions.

**ONLY £32.50 (carr. £1)**

## Versatile BEEB SPEECH SYNTHESISER Unit



**SIMPLY the best!** – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!

**PHONEMES** for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!

**BUILT-in** Library of approximately 500 words to get you started.

**ENGLISH** accent – Utilises inflexion techniques to produce highly comprehensible speech.

**EASY** to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!

**COMPACT** unit – The whole system is built into a small case – easily tucked behind the computer. Auxiliary output socket provided for direct connection to an external amplifier.

**HOURS** of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but **DON'T BE LEFT SPEECHLESS!** Order your Versatile Speech Unit now!

**Only £44**

## WATFORD'S LAUNCH OF THE YEAR APEX

The ultimate expansion system for the BBC microcomputer. It enables you to increase memory capacity to 2+/MEGABYTES including BATTERY BACKED-UP RAM.

The system consists of a mother board which fits inside the BBC and further daughter cards can be connected externally.

The internal card has the following features:

- 15 ROM/RAM sockets, 11 of which can be configured as 2716, 2732, 2764, 27128 EPROMs or ROM equivalent devices or as 6264 RAMs. Any RAM is Automatically battery backed-up and it's contents preserved when the power is turned off.
- The battery is recharged every time the machine is turned on and lasts several months, depending on the number of RAMs fitted.
- There is very little extra current drain, even with a fully loaded board as only the presently active ROM is powered up. In fact the fully populated board uses only 300mA.
- The board reduces micro bus loading by up to three ROM loads, which improves reliability and performance.
- Installation is extremely simple. There is no soldering required. The board is rigidly held by two 40 pin sockets and five support posts. A ribbon cable can be brought outside the computer and up to 8 external cards added. This enables the user to plug-in up to 142 paged ROMs. The cards have following features:

- Each card can accommodate up to 16 devices each of which can be configured as 2716, 2732, 2764, 27128 ROMs or 6264 8K RAMs.
  - Battery backup is provided from the internal card.
  - Only the active ROM is powered up permitting many external ROMs to be added with very little current loading (100mA per card!).
- The system comes with controlling software in ROM. The utilities supplied are as follows:
- APEX – replies with the device number currently being accessed.
  - APEX C – toggles between the colour and standard black and white messages.
  - AL – loads from any device, regardless of the data type.
  - AS – saves memory to any specified RAM device.
  - AD – prints a directory of the devices present in the system, i.e. ROMs present and files stored. This also reports on the amount of free storage space.
  - AF – asks for the free RAM devices.
  - LA – repeats the last command to paged ROMs.
  - AT – enters a memory testing routine. This will write a test pattern into the memory and read it back out again. If a fault is found, it is reported to the user. This test continues until Escape is pressed.
  - RDISC – activates APEX as a filing system which then treats all free APEX RAM in the system as a continuous 'RAM-DISC'. All commands have similar format to the DFS and transfer is possible between the two systems.

The complete computer system bus is available to the user, so that other cards/devices could be added such as EPROM programmers, second processors, Winchester disc drives, clocks, etc. By racking the cards you eliminate the tangled mass of cables that usually accumulates around the micro. A comprehensive operating manual is supplied with every APEX Board. Please write in for further details and prices.

## BEEBFONT ROM

BEEBFONT is a remarkable new concept in BBC software, exclusively available from Watford. Once fitted, the 16K ROM will enable you to produce attractive text displays in following different styles:

- ★ It works in modes 0, 1, 2, 4, using full colour.
- ★ Simply use Ctrl-V to select the font and all further screen output will be in a new style.
- ★ Even the ordinary Beeb character set can be enhanced by doubling height or width and emphasising to give bold print.
- ★ A comprehensive editor is included which enables the user to design his own characters.
- ★ A spooling program is provided, which enables pre-formatted text files to be displayed on an EPSON FX, RX, and NEC Printers, using the full range of character styles. (Please specify printer type when ordering). Can be used with WORDWISE.
- ★ This really must be one of the most original and exciting products of the year.
- ★ A twenty page manual is provided and the demo/editor software comes on disc or cassette (please specify when ordering). **ONLY £39**

## THE ULTIMATE DFS FOR BBC MICRO

by

**Watford Electronics**

Highly acclaimed at The ACORN and BBC MICRO USER Shows. What do the independent press say?

Good value for money – *Beebug Aug. '83*  
A very worthwhile package – *The Micro User*  
You'll be buying a very powerful package – *Personal Computer News*  
Superior DFS; Excellent disc sector editor – *Computer Answers*

Without a doubt, the most sophisticated DFS Software yet written for BBC Micro Computer. This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

Please write in for full technical specification.

**PRICES:**  
DFS (Disc Filing System) ROM **£29**

**Complete Disc Interface Kit including DFS ROM & Fitting instructions £99**

**Disc Filing System Manual.** Comprehensive and clearly written **£7.50 (no VAT)**

P.S. We will exchange your existing ACORN DFS or PACE (AMCOM) DFS for Watford's highly sophisticated 16K DFS ROM for **£25**

Watford's DFS is exclusively available from Watford Electronics. We do NOT retail through any dealers. Every ROM carries a label with our LOGO and a serial number.

**Now available:**  
Acorn DFS Kit **£95**

## EPROMs & CMOS RAMs

2764-250nS (8K ROM)	<b>£5.95</b>
27128-250nS (16K ROM)	<b>£24.00</b>
6116-150nS (2K RAM Low Power)	<b>£5.75</b>
6264-150nS (8K RAM Low Power)	<b>£28</b>



## WATFORD'S BEEB PRINTER ROM



Are you fed up with not being able to unravel your printer manual and use all those features you paid for? Need sensible paging for use in the creation of booklets? Then you certainly need our Beeb Printer ROM.

A machine code printer utility in ROM.

● 'Single' key operations replace control code sequences for underline, font and size selection, paper movement, etc. Up to 30 come pre-defined, without effecting normal fn key usage.

● This rom allows easy control of your printer from 'Within' WORDWISE text. Instead of long escape sequences, you just 'OC' a single number to Select, Underline, Print Styles, etc.

● Automatic fanfold page margins. Puts gaps in listings. PRINTed text etc to skip the folds. The gap size alternates to minimise paper wastage when using binders.

● Form feed and related commands, made available on ALL printers. Can also provide a left margin.

● User defined characters embedded within text are printed as on VDU.

●★Commands select option for GP100, STAR, NEC, MX/FX, LP VII/DMP100, DMP200. Operates with Parallel and Serial Printers.

● Fully functional with the popular WORDWISE wordprocessor.

Supplied complete with a comprehensive 50 page manual.

**Price: £24**

(When ordering, please specify printer type)

## DUMPOUT 3

A highly sophisticated machine code ROM providing screen to printer dumps in any mode, plus window setting utilities and two new OSWORD calls that allow you to use the Beeb graphic coordinate system for plotting or testing mode 7 'pixels'.

●GIMAGE Ultra sophisticated dump of any graphic screen, using up to 8 tones. Handles FULL MODE 7 text, graphics, double-height and colour and mode 8. 14 optional parameters, using 'prefixing' so that you only need specify the ones that you want. The parameters include:

● V<scale>, H<scale>. These are both 2 byte numbers giving you very fine control over the dump size from minute to enormous. Unlike other dump Roms, scale does not vary with screen mode.

● R <0-3> Dump rotation 0, 90, 180, 270 degrees.

● I<indent> Set gap from left edge of paper.

● X <min> <max>, Y <min> <max>. The area of the screen dumped is that in the graphics window, alternatively these parameters may be given.

● P Physical colour values used for dumping. (Otherwise use a negative scale, i.e. white prints darkest.)

● T Two tone dumps for higher resolution.

● M <mask> 8 bits controlling colour masking.

● E Contrast expansion. Makes mode 7 text characters and separated graphics stand out more clearly from the background.

● C All mode 7 graphics printed as reduced size dumps.

● \*GWINDOW Draws graphic window on screen, its size and position can then be altered using the cursor keys.

● \*TIMAGE <indent> Does a fast, text only dump of the text window in any mode.

● \*TWINDOW As GWINDOW but for text.

DUMP OUT 3 gives you ALL of the GIMAGE facilities listed above and GWINDOW in mode 7 as well, not just hi-res modes.

Ideal for CP80, GP80, DP100, GP250, STAR, KAGA/TAXAN, NEC, SHINWA, CP80, GEMINI, EPSON MX/RX/FX, LPVII, DMP100/120/200/400 Printers.

Comprehensive Manual included. **Only £22**

APPROVED for use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use.

**Watford Electronics**

## MODEM 84 For BBC Microcomputer

With the launch of Watford's MODEM 84 you can now hook into PRESTEL, MICRONET, HOMELINK, TELECOM GOLD, etc., for about the cost of a good tape recorder. Prestel gives you access to an incomparable database covering almost every subject under the Sun. There is Micronet with lots of free programs that you can download and run. Details of Clubs and User groups, a diary of meetings and exhibitions, news and reviews, technical information, etc. There is Homelink with On-line banking. And there is armchair shopping, travel information, Entertainment, World News, Sports News, Business News, Weather information, Electronic mail and lots more. The basic Prestel subscription is only £5 per quarter for domestic user and at off-peak times there is no charge for access time. Can you afford not to be part of this revolution?

Now using the latest techniques and the new generation of Modem chips, Watford have developed a Modem that is newer, better and yet cheaper than any on the market.

Compare the Specifications:

### MODEM

● Direct-connect Modem using BT approved isolation components.

● Full Duplex V23 operation for Prestel and TELECOM GOLD operation (1200/75 Baud).

● User-to-User half duplex 1200/1200 Baud operation with AUTOMATIC SEND/RECEIVE switch (BEWARE - most MODEMS switch manually between send and receive, which precludes the use of intelligent user-to-user software).

● Simple single button operation and comprehensive LED status display.

● Attractively finished. Sized to sit on the Disc drive.

### FX80 PRINTER DRIVER for VIEW

Do you want to use Italics or Enlarged Characters with View? French or German Characters? These and other FONTS from FX80 character sets can be accessed using our Printer Driver with VIEW. The disc contains an example as well shows how to use. Available on 40 or 80 track Disc. **ONLY: £9**

### EPSON DUMP ROM

A specially designed Dump ROM for EPSON RX, FX and the new Kaga KP810 Printers. Will accurately DUMP all Screen modes including TELETEXT, GRAPHICS and DOUBLE HEIGHT. MULTITONE DUMPS are also supported. Simple single command (\*SCDUMP) operation.

**Only: £20**



## NEW SUPER PRESTEL INTERFACE ROM

Fully compatible with Watford's MODEM 84 as well as with PRISM and most other Modems.

● Supports full Prestel Colour Alpha and Graphic Characters including Double Height, Flashing, Conceal/Reveal.

● Called by simple \*PRESTEL command. Disc and Tape configurations fully supported.

● Telesoftware downloader included.

● Comprehensive MAILBOX facilities including offline editor.

● Auto Logon sequence, can be burnt into ROM if desired.

● Unique "TAG" facility allows tagging and recall of interesting pages - avoids the common and annoying 'NOW WHERE WAS THAT PAGE' problem.

● Page load and save to tape or disc. Pages are automatically saved under Page Number reference in a 'FRAME' directory.

● Print page options are ASCII only (i.e. with suppression of Graphics) - fast and works with any printer - as well as a full graphics dump for the popular Epson printer.

● 'USER' function call built into interface with specialist add-on routines (your own as well as ours).

● All the above facilities available from Function Keys. An overlay is provided giving simple yet comprehensive guidance to the key functions.

● Comprehensive instruction manual supplied.

### PRICES:

SOFTWARE ROM incl. Comprehensive Manual **£20**

MODEM 84 (without software) **£62**

MODEM 84, SOFTWARE ROM and Operating Manuals **ONLY: £82 (£2 carr.)**

(Please allow upto 28 days for delivery)

Please write to Watford Electronics for full details, Order and Application Forms.

TINY PASCAL for BBC Micro **£59**

### VIEW

Wordprocessor (New version) **£49**

### FORTH ROM for BBC

This superb (FIG FORTH) compiling language now available in ROM. Simply plugs into one of the ROM Sockets. Manual included. **£33**

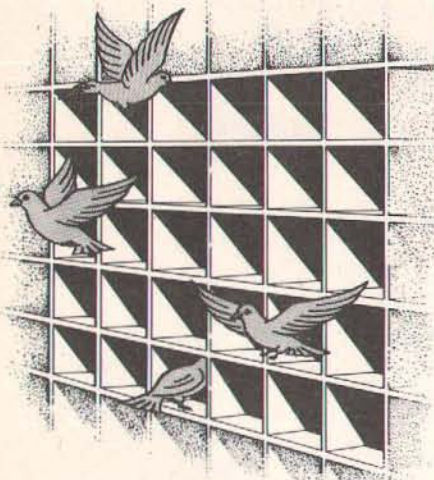
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Continued



## WONDERFUL WATFORD

### TWO DATABASE SOFTWARE for BBC MICRO



#### DISCDATA

At last for BBC Micro Disc users, Watford Electronics have produced 'DISCDATA' which must be the most versatile general database at the price on the market. The length of your files is restricted only by the space on your disc. You can have upto 20 fields with 'page' length records of upto 254 characters. The program is completely menu driven obviating reference to a manual although written guidance is given with the program. Add and delete records, amend title, field names and records, sort on any field and search for any record or group of records in any field. You do not need to abandon or rewrite your files if you wish to add additional fields or extend the length of any field, the program will rewrite the files for you. Your files can be in any drive. Output can be in 40, 80 or 132 character width with Printer routines. Two forms of output are provided for horizontal for label type output and a tabulated output with title and headings. What is more, the selected fields can be placed in any order on the screen. In the horizontal mode you can scan backwards or forwards with wrap around effect. Output can be started or stopped anywhere in the file. There is automatic totalling on decimal fields and an automatic count of the number of records output. Now with extra 3 features: Allows string search; Calculations can be done on numeric fields; Create Sub-Files from the main File.

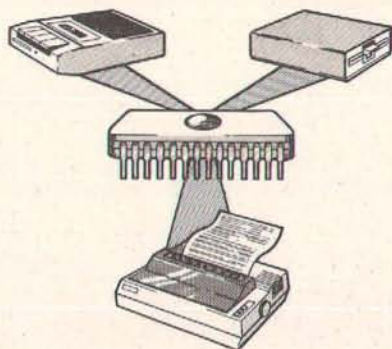
On disc at **Only £17**  
It has to be the best value.

#### FILE-PLUS

Now even more powerful with the added facility of a SHELL SORT on any field. This must make DATA-PLUS the most powerful and versatile Database to be found on BBC Micro. A 16K ROM containing the most flexible and easy to use disk based Database system on the market. A database may occupy your total on-line storage capacity. You may design any number of data entry forms using a "paint" on screen technique. Forms may be upto 3 screens in size. A form may be used to Add, Delete, Update, Print and Spool records from your Database. Quick search facility on any text field. A query language provides full maths support (+, -, \*, /, %, +999999999.9999) and compare facilities (=, >, <, <=, >=, &, !) when used with the keywords - Assign, Compare, Display, End, Goto, If, Ift, Print, Read, Search, Spool and Update. Full printed output control via embedded commands. Supplied with 70 page manual and fitting instructions.

**Only £43**

### BUFFER & BACKUP ROM



A very versatile firmware. An ideal ROM for engineers, programmers, teachers, students, etc.  
★ Converts your Sideways RAM to a 4K or 16K BUFFER for a parallel printer. (Uses \* FX5,3). (You no longer require to purchase expensive (£100+) Printer Buffers.)  
★ Dumps selection of Disc files to Tape.  
★ Makes backup copies of tapes onto Tape, Disc and Hobbit.  
★ Displays contents of a chosen paged ROM on screen.  
★ Menu display on 'shift-break' using ROM Filing System.  
★ Comprehensive Manual  
Simply a give away at **£22**

### GEMINI'S BUSINESS SOFTWARE

Cashbook Accounts	£52
Final Accounts	£52
Invoices & Statements	£17.25
Commercial Accounts	£17.25
Mailing List	£17.25
Database	£17.25
Stock Control	£17.25
Home Accounts	£17.25
Beebcalc Spreadsheet Analysis	£17.25
Beebplot	£17.25
Payroll	£39

N.B. All the above Gemini software is on tape. For Disc Based (40/80 track) please add £3.

### PEN PAL - VERSATILE LIGHT PEN SOFTWARE

- Enjoy, Explore, Educate!
- Pixil, Line, Character Definition
- Free hand drawing
- All Colours - MANY Special Effects
- Fill, Refill and Stripes
- User defined "Brushed Strokes" plus Character definer
- Grid, Scale, Perspective aids
- 2 TO 200 Points palletable in one Design with Circles and "RUBBER BANDING"
- Move design/character to any screen position
- Save and Load screens, User defined Graphics and line drawings for video titles, Own programmes, etc.
- Many Educational uses
- Instruction booklet included
- Full software support for "CUSTOM USE"
- Works with Watford, RH, Acorn User, DIY, and many other LIGHT PENS
- Available on DISC or TAPE

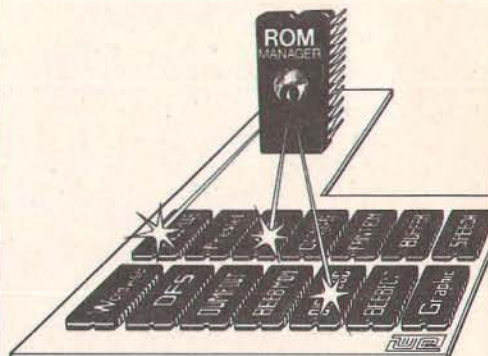
Price: Tape £10; Disc £11

### DISC EXECUTOR

**Disc Executor** (our most popular software) is a highly sophisticated disc utility, which allows you to transfer all tape based software that we know of onto disc. You no longer have to throw away any of your cassette based software on acquiring a disc drive. It handles 'locked' programs and allows you to load full length adventure type programs (i.e. up to & 6E blocks) and programs that load below &E00. It is very simple to operate (full instructions supplied). It saves you your valuable time and money too. Our Disc executor is not a Replica, its the 'Real Thing'. Available in both 40 and 80 track discs. Please specify when ordering.

**Only £10**

### ROM MANAGER



This unique piece of firmware has been designed to allow the USER to access the BBC Micro's Sideways Rom Paging facility to the full. The 18 Commands our ROM MANAGER adds to your computer are concerned with 3 aspects of ROM use:

- 1. ROM CONTROL** - Ability to activate at random any of the ROMs present in the Micro.
  - 2. BBC MICRO's STATUS** - e.g. Checksum on any ROM, and the Filing system currently active.
  - 3. ROM DEVELOPMENT** - Allows main memory to be used like Sideways RAM. The Commands available are:  
\***CHECKSUM** - generates a CRC for the specified ROM.  
\***DIRECT** - allows you to pass a particular command to the specified ROM.  
\***EXAMINE** - allows examination of the named ROM.  
\***EXPLAIN** - gives detailed description of the first 22 FX codes.  
\***FILE** - passes the command directly to the currently selected filing system.  
\***FUNCTION** - displays the string currently programmed onto the function keys.  
\***INCLUDE** - allows the main memory to be used for developing ROM software without need to purchase expensive sideways RAM.  
\***MODIFY** - any location in memory is displayed and can be modified with this command.  
\***NAMES** - displays the names of any resident ROMs.  
\***RAM** - allows the command to be passed directly to the 'RAM based ROM'.  
\***REMOVE** - turns off the 'RAM based ROM' option.  
\***SPECIFY** and \***DEFAULT** - specifies the default ROM and passes the named command to the default ROM specified.  
\***STOP** and \***START** - allows the named ROM to be disabled or enabled, preventing clashes between ROMs.  
\***STATUS** - provides information about the ROMs inside the BBC micro, including the socket number, the name of the ROM, its length, whether or not it is enabled and supports language or service entry points.  
\***VALUES** - outputs information concerning the status of ROM MANAGER e.g. the socket number it occupies, the number of active ROMs with a higher priority than itself, the current filing system.  
\***VECTOR** - the same function as \***DIRECT**, but provided in case \***DIRECT** clashes with other ROMs.
- In our opinion this ROM is one of the most useful utility ROMs available on the market, and is a must for anyone using ROM based software.

Price: **Only £21**

### ADE

The complete program development package on 16K ROM. A must for all the Assembly Language Programmers.

**SPECIAL OFFER £49**

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# HIGH RESOLUTION THAT COMES HIGHLY RECOMMENDED.

**"There is no doubt that the JVC range of ECM colour monitors is excellent value for money . . . there is no loss in quality of picture after long periods . . . and remember, as more and more resolution is available with new micros, the need for a better display will be that much greater."**

High recommendation indeed from Personal Computer News. Meanwhile Acorn User said:

**"It seems that all 'normal' and 'medium' resolution monitors, including the Sanyo, are simply inadequate to deal with the Beeb's graphics and text output . . . The JVC was excellent, giving clear, legible results . . . Was the JVC better than the Microvitec? Would I buy one? Yes to both questions."**

Our RGB high resolution colour monitor (580 x 470 pixels) sells for £229.95 (excluding VAT) – that's a saving of over £100 compared with other leading monitors of similar specifications.

The unit has a 14" screen and is suitable for the BBC Micro, Electron, Sinclair QL, Lynx, Oric, Apple, IBM and most other leading micros.

MODEL REFERENCE	1302-2 High Resolution
RESOLUTION	580x470 Pixels
C.R.T.	14"
SUPPLY	220/240v. 50/60Hz.
E.H.T.	Minimum 19.5kv Maximum 22.5kv
VIDEO BAND WIDTH	10MHz.
DISPLAY	80 characters by 25 lines
SLOT PITCH	0.41mm
INPUT: VIDEO	R.G.B. Analogue/TTL Input
SYNC	Separate Sync on R.G.B. Positive or Negative
EXTERNAL CONTROLS	On/off switch and brightness control

And naturally there's a year's full guarantee.

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Simply post the coupon below to: Opus Supplies Ltd., 158 Camberwell Road, London SE5 0EE. Or telephone 01-701 8668 quoting your credit card number. Or, of course, you can buy at our showroom between 9.00–6.00pm, Monday–Friday 9.00–1.30pm, Saturday.

\*Microvitec Cub 14" monitor.

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Please send me:

- \_\_\_\_\_ High Resolution Colour Monitor(s) at £229.95 each (ex. VAT).
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I understand carriage per monitor will cost an extra £7.00. (N.B. A High Resolution Monitor including VAT, lead, and carriage costs £279.39. A Medium Resolution Monitor including VAT, lead and carriage costs £221.89).

I enclose a cheque for £\_\_\_\_\_ Or please debit my credit card account with the amount of £\_\_\_\_\_. My Access/Barclaycard (please tick) no. is \_\_\_\_\_

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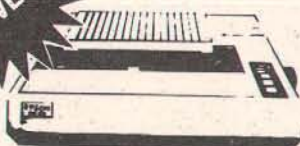


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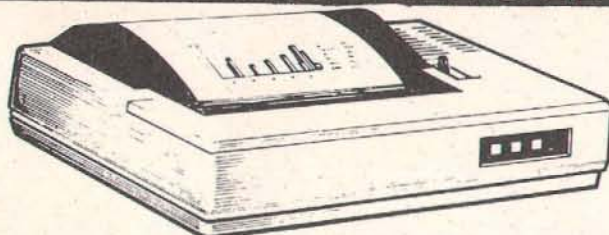
## EPSON LOW PRICE SPECIALS FROM £199

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EPSON RX80FT (DOT MATRIX) . . . . .	<del>£285</del>	<b>£239</b>	+ VAT = £274.85
EPSON FX80 (DOT MATRIX) . . . . .	<del>£438</del>	<b>£324</b>	+ VAT = £372.60
EPSON MX100 (DOT MATRIX) . . . . .	<del>£475</del>	<b>£365</b>	+ VAT = £419.75
EPSON RX100 (DOT MATRIX) . . . . .	<del>£450</del>	<b>£385</b>	+ VAT = £442.75
EPSON FX100 (DOT MATRIX) . . . . .	<del>£569</del>	<b>£499</b>	+ VAT = £573.85

## NEW! Canon PW-1080A £269.00



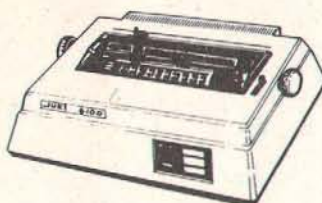
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80 cols; High speed printing, 160 CPS; bi-directional logic seeking; fantastic 27 CPS near letter quality; 23 x 18 matrix; very quiet - less than 60 dB; 4, 5, 6, 8 10, 12, 17 CPI; down loading for user-optional characters; high resolution graphics; handles various forms, roll paper, fan fold, single sheet and multipart copy paper.

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TRADE



HAVE a look at Program I – you should see that it's nearly identical to last month's Program IV with one important alteration – all the variables are real variables rather than integer variables. That is, I've left off the % signs.

```
10 REM *** PROGRAM I ***
20 MODE 6
30 VDU 14
40 INPUT "Maximum Number", max
50 DIM square(max),cube(max)
60 FOR loop = 0 TO max
70 square(loop)=loop*loop
80 cube(loop)=loop*loop*loop
90 NEXT loop
100 FOR loop=0 TO max
110 PRINT loop,
square(loop),cube(loop)
120 NEXT loop
130 VDU 15
```

If you saved Program IV, as I suggested last month, all you have to do is some nifty work with the copy key.

However, the change from integer to real means a lot more to the micro than just a missing character. You see, the micro remembers, or stores, real variables in a different way to integer variables.

In fact, it takes up more memory in storing a real variable than it does when storing an integer.

This isn't surprising, since real variables have to remember all the fiddly decimal bits, as well as the whole part of the number.

The way we measure memory is in bytes – as a rule of thumb, you can store one letter in one byte of memory. So ABCD would take up four bytes just for its own characters.

Numbers are a special case – I'll spare you the grim details. Unlike strings, where the number of bytes you need depends on the number of characters in the string, each number is stored in a fixed amount of bytes.

Integer variables take up four bytes each. Mind you, there's only so much you can cram in there.

As we found last month, there's an upper limit – though at 2,147 million I

# Accuracy, memory or speed?

don't think we can complain much.

Reals, however, take five bytes each, using what's known as floating point notation.

Basically, what they try to do is remember as many of the digits in the number as possible, using four bytes – almost like in integers.

The fifth byte stores the exponent – that is how many tens you multiply by – needed to change the four digits into approximately the number you wish. This is very similar to the 1E9 notation we saw last month.

Notice the word approximately – this method does its best, but it cannot guarantee accuracy. After all, you've only got one more byte to remember things in than you had with the integers, and yet you're trying to cover bigger numbers and still include decimals.

To see what I mean try:

```
A=1.555555555555555
PRINT A
```

You should get 1.55555556.

Okay, so it's not spot on ... but the error is well below a millionth.

Don't become complacent about this high level of accuracy – nobody enjoys receiving a gas bill for £63.99999999!

Run Program I and enter 1000. You should get the same results as you did last month when you ran Program IV. (If you didn't save it, and want to check, I've listed it again as Program II.)

```
10 REM *** PROGRAM II ***
20 MODE 6
30 VDU 14
40 INPUT "Maximum number", max%
50 DIM square%(max%),cube%(max%)
60 FOR loop%=0 TO max%
70 square%(loop%)=loop%*loop%
80 cube%(loop%)=loop%*loop%*loop%
90 NEXT loop%
100 FOR loop%=0 TO max%
110 PRINT loop%, square%(loop%),
cube%(loop%)
120 NEXT loop%
130 VDU 15
```

Try running both programs entering 2500 as the maximum – use 2000 if you have a DFS.

On Program I, which uses real variables, you'll get the error message:

**DIM space at line 50**

whereas Program II, which uses integers, will give you:

**Too big at line 80**

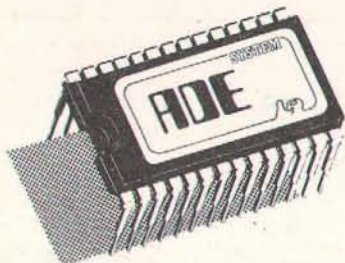
The point is, when you DIM a numeric variable array, the micro is bright enough to work out how much memory you need in total – since it knows how many bytes each variable in the array will take.

If you haven't got enough room you



# SYSTEM SOFTWARE

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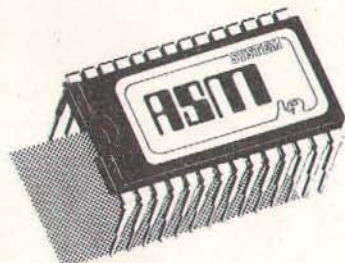
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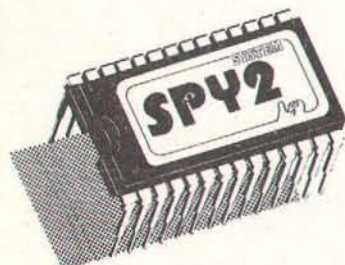
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SPY2 features a versatile disassembler with hex dump, full and intelligent disassembly. This identifies data areas in the program; these being displayed as a hex/ASCII dump. Operating system calls are labelled creating very readable code. The powerful trace facilities enable program instructions and register contents to be traced to printer whilst the program is running. Indispensable for graphics programs as they can be stepped through whilst observing the effects on the screen.

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# SYSTEM

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## From Page 45

get the DIM space error message.

Now integer variables take up one byte less memory each, so you get away with dimensioning, or allocating, enough memory for your 2500 variables. However you fall foul of the limitations on the size of numeric variables and so get the "Too big" message.

The reason I suggested 2000 for discs rather than 2500 is because, when you have a DFS fitted, it grabs some of your micro's memory.

Since there's less memory left, it means the above "effects" happen earlier.

This memory stealing habit of the DFS is why many programs need "downloading" in order to run. This means you load the program in, then tell the micro the DFS isn't there and steal back the memory!

If you have a DFS and get a Bad Mode or DIM space message, it's six to four on you need a downloader. See the July 1984 issue of *The Micro User* for the remedy.

To return to the subject, even with integers, if you want too many variables or elements in your array you'll get a DIM space message.

However, accuracy and memory size aren't the only differences between real and integer numerics. The fact is, integers are far quicker than reals at doing sums.

To show this, we'll need to take a rather fascinating detour. Try Program III:

```
10 REM *** PROGRAM III ***
20 MODE 6
30 TIME=0
40 REPEAT
50 UNTIL TIME=500
60 VDU 7
```

TIME is a variable that the BBC Micro increases by one every hundredth of a second.

When you switch on the micro, TIME is at zero, but it increases by one every hundredth of a second.

You can change the value of TIME by assigning it a value, as you would a variable, but as soon as you do it keeps on increasing by one every hundredth of a second!

This is exactly what we do in Program III.

Line 30 sets TIME to zero and then

lines 40 and 50 patiently repeat doing nothing at all until TIME equals 500. You then drop out of the bottom of the loop.

Line 60 then does a VDU 7 which causes the micro to beep.

The whole thing should take about five seconds – at least to the accuracy

## **'..integers are far quicker than reals at doing sums'**

with which you'll be able to press your stopwatch!

To prove that TIME really is varying, add:

### 45 PRINT TIME

Sometimes, however, although you want to time something, you don't want to fiddle with the actual value of TIME – you may be already using it to time something else, for instance.

This is no problem. All you have to do is store the value of TIME in a variable at the start of the timing period, then keep on checking until TIME has increased past the old, stored value of TIME plus the period you're timing.

In Program IV we save the value of TIME with:

### 30 time% = TIME

We repeat until TIME is more than 500 greater than this same value, as in line 50:

### 50 UNTIL TIME - time% > 500

The whole thing does exactly the same as Program III without interfering with the actual value of TIME which is

still ticking away in the micro, increasing by one every hundredth of a second.

To show the difference, add:

### 45 PRINT TIME

and run the program.

To return to our discussion of Programs I and II, and the differences between numeric and integer variables. TIME allows us to time the difference in speed between Program I, with its integer variables, and Program II, with its numeric variables.

We'll need to make some alterations. Lines 30 and 130 will have to go – after all, we don't want to time the micro waiting for us to press Shift!

Next add the following lines:

### 55 TIME = 0

and:

```
130 PRINT "Time taken was "; TIME/100;  
" seconds."
```

These amendments should let us know how long it takes to calculate and print out the squares and cubes.

Try a maximum of 100 with both programs and you should find that integers are faster than numerics – though not by much. In my case, it was four seconds for integers as opposed to 4.38 for the reals.

When you think about it, though, we're not just timing the calculations, we're also timing how long it took to put them on the screen.

To make it fairer, let's get rid of the printing-out loop, lines 100-120, in both programs, with:

### DELETE 100,120

If you now run both for a maximum of 100, you'll see how much time was taken up simply printing things out! Also you'll see that the integer variables are far faster than the reals.

My times were 0.54 seconds for the integer and 0.88 seconds for the real – a saving of about 40 per cent.

So if you've got a lot of calculations, and don't need decimal accuracy – use integer variables.

Incidentally, if you get other values, don't worry. If you use a second processor, for instance, the times drop to 0.36 for integers and 0.59 for reals.

*Well that's all for this month... Next month it's time for something completely different!*



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## GRAFKEY/GRAFDISK: disk £12.95 cassette £9.00

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## NIGEL PETERS continues his teletext tales . .

IN my last article about Mode 7 I dealt with the way we can use control codes to produce coloured text and backgrounds. We also learnt how to make the text flash and how to produce double height letters.

Now we'll go into using Mode 7's graphics capabilities. Although rather crude compared with the BBC Micro's other modes, Mode 7 can produce some entertaining displays as a glance at Ceefax or Oracle will show.

As we might expect from our earlier experiences, we access these graphics capabilities by making use of control codes. These tell the micro that instead of text it is to display block graphics.

These are rectangles made up of six squares, as shown in Figure I. Each block is the size of a capital letter.

Each of the six squares making up a block can be either on (that is, the foreground colour is shown) or off (the square is the background colour).

Lighting various combinations of these squares allows the micro to have available 64 different graphics characters. Figure II shows the shapes on offer.

When we want the micro to produce block graphics we use one of the control codes shown in Table I.

As you can see from this, seven codes are available. If we wanted to have red block graphics we would use:

```
PRINT CHR$(145)
```

in just the same way as previously we used:

```
PRINT CHR$(129)
```

to get red text.

However we have 64 block graphics characters to choose from. We have to tell the micro not only that we want block graphics and, at the same time, their colour, but also which character we want. This is done by using another set of control codes, those from 160 to 191 and 224 to 255.

The control codes and the character they refer to are shown in Figure II. Run Program I and you'll see them on the screen. The CHR\$(145) picks red

Code number	Graphics colour
145	red
146	green
147	yellow
148	blue
149	magenta
150	cyan
151	white

Table I: Block graphics codes

## Getting to grips with graphics

graphics while the FOR...NEXT loops decide which blocks appear.

```
10 REM PROGRAM I
20 FOR code= 160 TO 191
30 PRINT code,CHR$(145)CHR$(code)
40 PRINT
50 NEXT code
60 FOR code= 224 TO 255
70 PRINT code,CHR$(145)CHR$(code)
80 PRINT
90 NEXT code
```

These shapes can be combined in many different ways to produce quite effective displays. Use PRINT and TAB along with Figure II and Table I to try your hand at Mode 7 graphics.

It's not hard, you just have to remember where on the screen each of the characters has to go and that the control codes, although invisible, take up a space.

You'll be pleased to know that the codes we learnt in the last article also

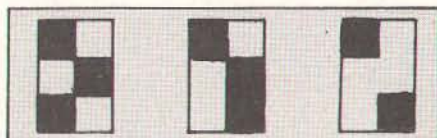


Figure I: Block graphics characters



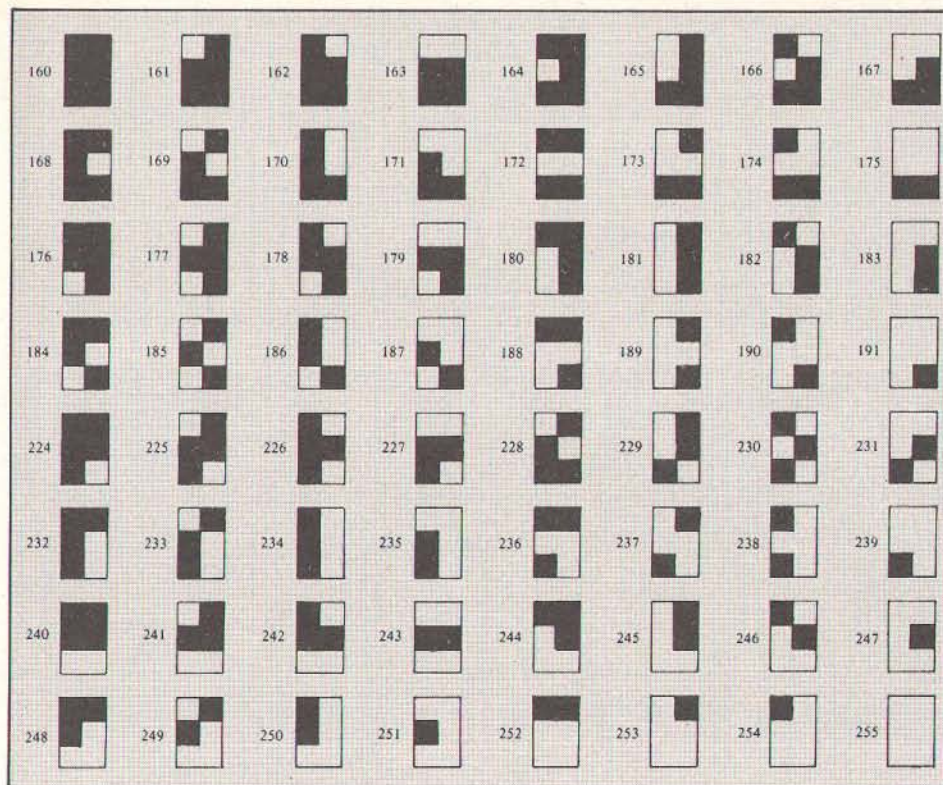


Figure II: Graphics characters and their codes

work with graphics characters. Program II shows them in action.

```
10 REM PROGRAM II
20 PRINT "DIFFERENT BACKGROUND COLO
UR"
30 PRINT CHR$(130)CHR$(157)CHR$(14
8)CHR$(230)
40 PRINT "FLASHING"
50 PRINT CHR$(130)CHR$(157)CHR$(13
6)CHR$(148)CHR$(230)
60 PRINT "DOUBLE HEIGHT"
70 PRINT CHR$(130)CHR$(157)CHR$(13
6)CHR$(148)CHR$(141)CHR$(230)
80 PRINT CHR$(130)CHR$(157)CHR$(13
6)CHR$(148)CHR$(141)CHR$(230)
```

It's not always easy to remember what the code for a particular character

1	2
4	8
16	64

Figure III: Square values

is. Of course they're all shown in Figure II and on page 488 of the User Guide, but these may not always be available.

Happily there is a way of calculating the control code of a character. Each of the squares that makes a Mode 7 graphics character has a value, as shown in Figure III.

All you do when you want to know a character's code is to decide which squares are going to be in the foreground colour. Then total the values of those squares and add 160. The result is the control code for that character.

Although it sounds complicated, it's quite simple in practice. Certainly I find it a lot easier than looking through the lists when the character I want invariably seems to hide. Figure IV shows a sample calculation.

As you might guess, we can use combinations of the various graphics

```
10 REM PROGRAM III
20 PRINT CHR$(150)CHR$(183)CHR$(23
5)
30 PRINT CHR$(150)CHR$(189)CHR$(23
8)
40 PRINT CHR$(150)CHR$(245)CHR$(25
0)
```

blocks to produce something akin to user defined characters. If we wanted, for reasons best known to ourselves, to produce a cyan figure 8 three lines deep then we could use Program III.

Here the CHR\$(150) tells the micro that we want cyan block graphics while the other six codes define which shapes are to be used. Try varying the program with your own choice of character shapes.

Now after having given you Figure II, which lists the shapes available and their codes, I'll tell you that there's a different way of getting the blocks.

If you follow one of the graphics control codes with a string made up of lower case letters, numbers or punctuation marks you'll get graphics characters, not the letters or symbols you might expect.

Program IV shows this in action for each of the lower case letters of the alphabet.

```
10 REM PROGRAM IV
20 FOR x=1 TO 26
30 alphabet$="abcdefghijklmnopqrstuvwxyz"
40 string$=MID$(alphabet$,x,1)
50 PRINT CHR$(148);string$ CHR$(12
9);string$
60 PRINT
70 NEXT
```

The full set of symbols and the graphics characters they give are shown in Figure V.

Using this method we could produce our large 8 – magenta this time – in a much shorter program. Program V shows how this is done.

```
10 REM PROGRAM V
20 PRINT CHR$(149)"7k"
30 PRINT CHR$(149)"=n"
40 PRINT CHR$(149)"uz"
```

We could even replace three lines with one by using the control codes 10 and 8 to move the print cursor one space

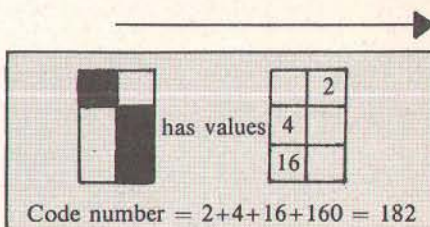


Figure IV: Calculating codes



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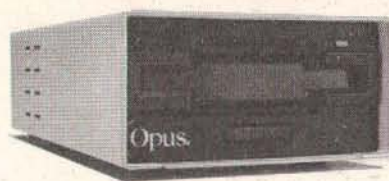
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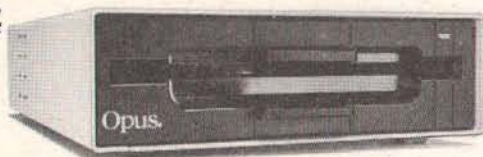
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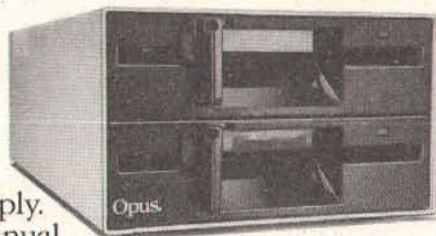
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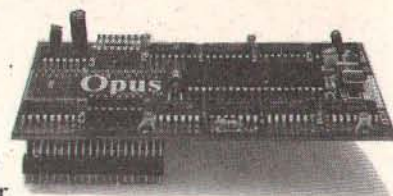
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## From Page 51

down and one space left respectively. This is shown in Program VI.

```
10 REM PROGRAM VI
20 PRINT CHR$(149)"7k"CHR$(10)CHR$(8)CHR$(8)CHR$(8)CHR$(149)"=n"CHR$(10)CHR$(8)CHR$(8)CHR$(8)CHR$(149)"uz"
```

You'll notice that the whole thing is getting more and more like a user defined character, and you may be wondering if we could replace all those CHR\$s with a string of VDUs as we did at the end of the last article. The answer is yes, we can – and Program VII shows how it's done.

```
10 REM PROGRAM VII
20 VDU 149,183,235,10,8,8,8,149,18
9,238,10,8,8,8,149,245,250,10
```

It's much neater, but for the rest of the programs in this article I'll stick to using CHR\$. I think it makes things a little clearer.

If you're wondering what that last control code does, it just puts the prompt on the next line. Try leaving it out and see what happens.

Because the 149 code is still working on that line, the prompt is interpreted as a block graphics character with ugly results.

Before you read on, just make sure that you understand what we've covered above. Have a go at producing your own Mode 7 shapes on screen, using any of the methods outlined above.

You'll find that, with a little practice, it's quite easy to do.

Having got so far, now's the time to tell you that we've only dealt with one of the two forms of block graphics available in Mode 7.

We've been using contiguous block graphics. We could also have used something called separated graphics. Program VIII, a variant of Program IV, shows the difference.

```
10 REM PROGRAM VIII
20 FOR x=1 TO 26
30 alphabet$="abcdefghijklmnopqrst
uvwxyz"
40 string$=MID$(alphabet$,x,1)
50 PRINT"CONTIGUOUS SEPARATE"
60 PRINTCHR$(148);string$,CHR$(154)
);string$
70 NEXT
```

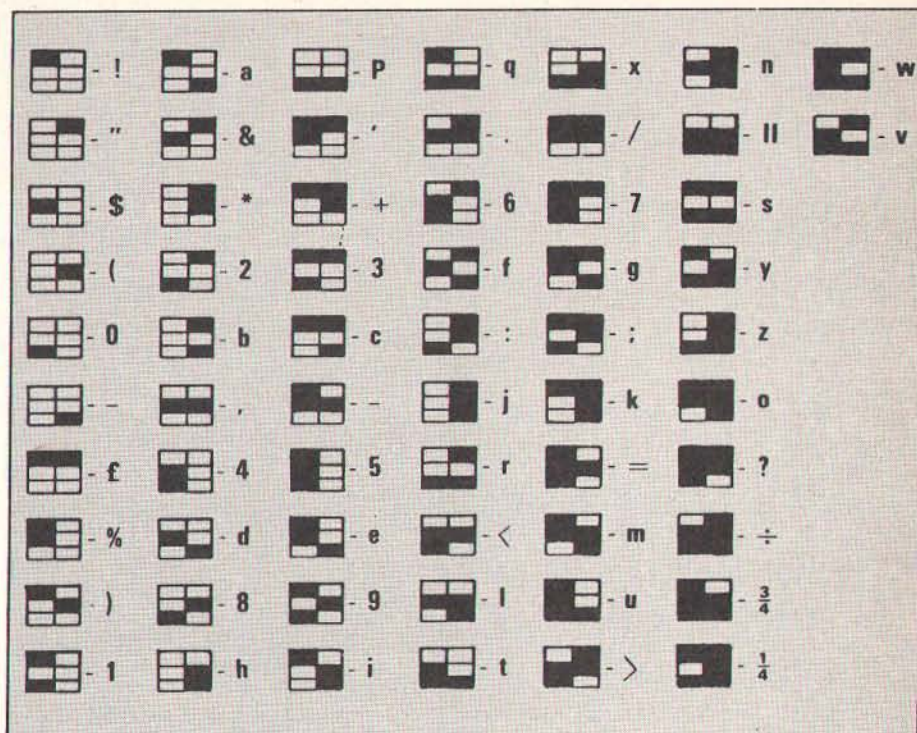


Figure V: Symbols for graphics blocks

As you can see, contiguous graphics have all the squares that make them up joined together. Separated graphics have all the six squares which make up that character separated by the background colour.

It's as though there's a border around each square, and consequently between adjoining characters on the same line. You get the "skeleton" of the block.

Contiguous block graphics are the default – the micro will use them unless you tell it differently. You can switch to separated graphics by using the control code 154 and back to contiguous graphics with control code 153.

Which you use depends on what effect you want. At times separated graphics look much neater than contiguous ones.

Try out some of the earlier programs

```
10 REM PROGRAM IX
20 PRINT CHR$(147);
30 FOR repeat=1 TO 10
40 PRINT CHR$(247);
50 NEXT repeat
60 PRINT CHR$(148);
70 FOR repeat=1 TO 10
80 PRINT CHR$(251);
90 NEXT repeat
100 PRINT
```

using CHR\$(154) to get separated graphics and see what you think.

While you've been playing around with Mode 7 you may have come up against the fact that the control codes, although invisible, take up a space on the screen.

While this doesn't matter too much in text, it can mess up graphics displays. You don't want gaps all over your beautiful artwork. Run Program IX and you'll see what I mean.

The program gives the 20 shapes required, but that gap in the middle spoils the effect. That's where the control code 148 is hiding.

You might have wondered if there was a way round this effect and there is, using yet another set of control codes.

Control code 158 has the effect of holding the graphics. What this means is that when you use that code in a line the micro will carry on printing out the required block graphics characters.

However when it comes to another control code, instead of leaving a space as normal it fills that space in. It does this with the same graphics character as the last one it used. So by using the hold graphics code the ugly gap of Program



## From Page 53

IX can be avoided. Program X shows how this is done.

```
10 REM PROGRAM X
20 PRINT CHR$(147);
30 FOR repeat=1 TO 10
40 PRINT CHR$(247);
50 NEXT repeat
60 PRINT CHR$(158)CHR$(148);
70 FOR repeat=1 TO 10
80 PRINT CHR$(251);
90 NEXT repeat
100 PRINT
```

Eagle-eyed readers will have spotted that, although the lines are joined, there are 11 of the first character and 10 of the second. The space of Program IX has been filled in with the previous block graphics character.

This holding effect can be switched off. The control code 159 returns the rest of the line to the normal way of things, where control codes appear as spaces.

And that's nearly the end, apart from

one last control code, 152. This conceals the display.

Anything that comes in a line after a 152 is automatically the background colour. This, of course, means that you can't see the rest of the line.

Printing something on the screen that you can't see may sound a bit daft but it does have its point. By printing a message on the screen invisibly and then overprinting the 152 control code with a

```
10 REM PROGRAM XI
20 CLS
30 PRINT TAB(1,11)CHR$(130)CHR$(15
2)"GREEN"
40 PRINTTAB(1,12)CHR$(131)CHR$(152
)"YELLOW"
50 PRINTTAB(1,13)CHR$(132)CHR$(152
)"BLUE"
60 PRINT TAB(1,23)"PRESS SPACE FOR
NEXT COLOUR"
70 FOR X=11 TO 13
80 WAIT$=GET$
90 PRINT TAB(2,X)" "
100 NEXT
```

space you can make things appear as if by magic. In a way, it's the Mode 7 version of VDU 19.

Program XI shows you the conceal display control code in action. You don't see the messages until the code is overwritten with a space.

And that's the end of our tour of Mode 7. Table II sums up these last control codes.

Control code	Result
152	Conceal display
153	Contiguous graphics
154	Separated graphics
158	Hold graphics
159	Release graphics

Table II: Graphics control codes

As you can see, the basics of the mode are quite simple, but the effects obtained using the control codes can be complicated. And the great advantage is that you aren't using up lots of precious memory.

Have fun!



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## MAKE THE MOST OF YOUR JOYSTICK

When you bought your BBC Model B, or a PLUS 1 or one of the other analogue interfaces for the ELECTRON, then you paid out a fair amount of money for the A/D converter. Don't waste it by buying switched joysticks. ACORN did not put all this additional cost onto the machines without considering its worth against a switched joystick option which could have been run from the user port without any additional hardware.

A switched joystick cannot properly simulate an analogue one but an analogue one can simulate a switched one with extra facilities. Three types of joystick are around for the BBC at the moment. These are:-

- (a) Switched type that plugs into the user port.
- (b) Switched type modified to plug into the analogue port.
- (c) Fully analogue.

Firstly, don't buy a switched joystick that plugs into the user port. Joystick software for the BBC is written to run from the analogue port. A joystick of this type will need a conversion routine, even to run programs that have an ACORNSOFT compatible joystick option. Conversion software can cause problems, it can interact with the hardware timers in the user port, or affect the speed of the game, or sometimes the conversion cannot be located because all available memory is used.

The switched type of joystick that plugs into the analogue port has been fitted with resistors to give

three values in any plane. These values are full on, full off or half way. This type of joystick will run programs which only require up, down, left, right or diagonal movement in one speed.

The type of joystick really intended to be used on the BBC is a fully analogue one. Few programs are around yet which really take advantage of the variable rates and angles that can be used with this type. Two programs that do are AVIATOR and SNOOKER from ACORNSOFT and you need analogue joysticks to play the joystick versions of these programs. On AVIATOR the joystick replaces the real Spitfire's joystick. A slight movement of the joystick will cause the plane to change direction slowly and a large movement will make it change direction sharply.

In SNOOKER the angle of the shot is directly related to the angle of the joystick and the strength of the shot is determined by the deflection of the joystick from the centre position.

Most things in real life are analogue. For instance, imagine driving a car with only idle or flat out, forwards or backwards and brakes that were either hard on with the wheels locked or not on at all. Imagine picking up an egg with a hand that was either open or fully closed. An attempt can be made to simulate analogue movement with switches by causing the switch to adjust the rate at which something is moved. The keyboard version of AVIATOR is like this—as long as

you hold down a key the aircraft joystick is moved in that direction—O.K until you need to suddenly swing the other way because you will have to wait while the joystick is driven back to centre and then off in the other direction.

In the on-going debate as to whether video games are good or bad for young children; one of the "for's" is that they improve co-ordination between hand and eye. This is only true if there is a direct relationship between the position of the hand (joystick) and the object on the screen. It is not really improving co-ordination if the object moves at a rate determined by software regardless of the relative position of the stick or the pressure applied to it or the speed that is moved.

Similarly the absolute position of a cursor in a graphics program is best done with analogue joysticks. The cursor can be moved a tiny bit by making a fine adjustment in any direction or can be put the other side of the screen as quick as the joystick can be moved.

To help you make the most of your joystick we are offering free listings of some useful joystick utilities for just sending us a stamped addressed envelope and returning the enclosed form.

*by Tony Pearmain*

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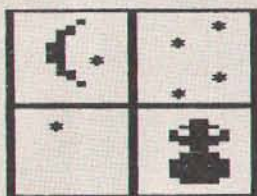


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# Teletext screen dump

P.142 DATEXT (P100-149) PAGE ???

## Daddy was late



It was a cold winter's  
night and daddy was late.  
Katie and Paul looked out  
of the window for him.  
They saw a snowman.  
"Mummy there's a snowman

in our garden," they said.

"Let me see," said mummy.

"Oh yes," she said.

press SPACE for next page

P.143 DATEXT (P100-149) PAGE ???

## Daddy was late

(continued)

The snowman moved.

"Look mummy, the snowman is moving."

The snowman walked up the path.

Katie and Paul were  
scared.

Knock, knock on the  
door went the snowman.

"Let me in," said the  
snowman.



press SPACE for next page

P.144 DATEXT (P100-149) PAGE ???

## Daddy was late

(continued)

"I'm daddy. I'm  
all covered in  
snow."

Katie and Paul  
giggled. They  
let him in. They  
were pleased. Their daddy was a  
snowman.



THE END.

INTEREST in Mode 7 has greatly increased over the past few months. Its economical use of memory is especially important if you also have a DFS, which reserves nearly 4k for its own use.

Also access to transmitted screens is becoming more common with Prestel, Micronet, Ceefax and Oracle.

With this interest comes the need to dump screens of information onto a printer.

But before this can be done a number of problems need to be overcome.

Teletext characters are divided into both printable and control characters, which are responsible for the many special effects that can be produced.

These control codes have an effect on all the rest of the characters on that screen line unless a control code to cancel or alter the command is given.

For example, if the control code 129 is found at the start of the line, all the rest of the characters will be printed in red.

However if that code is 145, instead of the normal keyboard characters (except for upper case letters), graphics symbols will be printed instead. These form part of a 3 x 2 mosaic, the parts that are printed depending on the Ascii value of the character (see Figure 1).

As a further complication, these graphics can be printed together or

1	2
4	8
16	64

To find the Ascii value of a graphics character add together the value of each part of the mosaic that is to be printed, then add 32.

Figure 1

slightly separated. It is also possible for characters to be printed double height.

Another problem is that a number of the characters differ between Modes 0-6 and Mode 7 (see Figure II).

Mode 7 has its own character generator which uses different numbers for some characters to those used in Modes 0-6 (see Figure III).

In normal use you are unaware of this



## PROGRAM DESCRIPTION

### Lines

50 PROCinit defines the non-standard characters required for Mode 7.  
60 Loads the screen file that is going to be dumped.  
70 Points to the error handling routine.  
80 Enable output to printer.  
90 Makes sure that the printer starts on a new line.  
100 Loop counter for the screen rows.  
110 Resets these flags at the start of each line.  
120 A command to the printer telling it to expect 320 bytes of 8 bit graphic data.  
130 Loop counter for each character position in the current row.  
140 Moves current text pointer.  
150 Gives the Ascii value of the character under the text pointer.  
160-210 Sets program flags according to any teletext control codes.  
220 If it was a control code or a 'space', sends a series of 8 zeros to the printer.  
230 GOTO the graphics routine if the graphics flag has been set, but not if the character is upper case or a #.  
240 Swaps certain characters around so that the character set 160-254 is the same as those 32-126.  
250 Picks out the teletext characters which differ in Modes 0-6.  
260 Prints a "normal" character.  
280 close is a flag which is set if the previous line had a double height or graphics character. If close is set, a

290

320

380-420

430-520

530

570-580

620-730

740

printer command is sent so that adjacent lines are placed together, otherwise there is a small gap to aid legibility with text characters.

If your printer needs a line feed (char. 10) to go onto the next line - that is, you have to type in \*FX6 before you normally do any printing - make sure you include the 10 in the statement, otherwise it can be omitted.

This is important if the Escape key is pressed during the dump. After the command on line 120 the printer expects 320 bytes of graphic information. If it doesn't the results are, to say the least, interesting!

Sets up some variables and flags.

Defines those characters which differ between Mode 7 and the other modes.

Assembles a short piece of machine code.

Flags and pointers which let the program know whether it is the upper part or the lower part or a double height character that is to be printed.

Calculates values for a character definition according to the formula given in Figure 1. Since defined characters have an 8 x 8 matrix and teletext graphics have a 3 x 2 format, the top and bottom graphics blocks are given three lines each while the middle blocks are given two.

Alters the graphics vari-

750

760

770

810-830

840

880-890

900

940

950

990

1000

1010

1020

1030

1070-1590

1640-1670

ables if the separate graphics flag is set.

Defines character 226.

s% is a pointer to the defined character.

Gives the defined character to the output routine.

Works out the offset to the defined character table in page &C00 (as defined by PROCinit).

Points to the defined character for the output routine.

All the characters of Mode 0 to 6 are defined in the operating system starting at &C000. s% will point to the start of the character definition.

Points to the character definition for the output routine.

When the double height flag is set, this routine checks whether it is the top or bottom line of the character...

... then either the top line or the bottom line is copied to another location, doubling its height in the process.

Enlarges character if necessary.

!&80 points to the start of the character definition.

!&82 points to the locations where the manipulated character is to be placed.

Calls the machine code manipulation routine.

Outputs the character to the printer.

Assemble the character manipulation routine.

Simple routine to load a Mode 7 screen file.

because the operating system swaps them around without you knowing. To confirm this try this experiment.

After the screen has been cleared, type in:

?&7C00=35

A £ sign will appear in the top left of the screen. Now type in:

VDU 35

This time a # sign will be printed, confirming that character number 35 can appear differently depending on whether it is printed using the operating system or placed in the screen memory directly.

There are a number of different ways

Ascii	Mode 7	Mode 0 to 6
91	←	
92	1/2	\
93	→	
94	↑	^
95	-	-
123	1/4	{
124	11	!
125	3/4	}
126	÷	~
255	■	

Figure II: Different characters in Mode 7 and Modes 0 to 6

Teletext Internal Number	Converted to
95	35 #
96	95 -
35	96 £

Figure III: "Swap around" character.

a teletext screen dump program can be written:

● The Mode 7 display could be converted into another screen mode and then put on a printer using a standard screen dump routine. (You'll run out of memory if you add this program onto another one.)

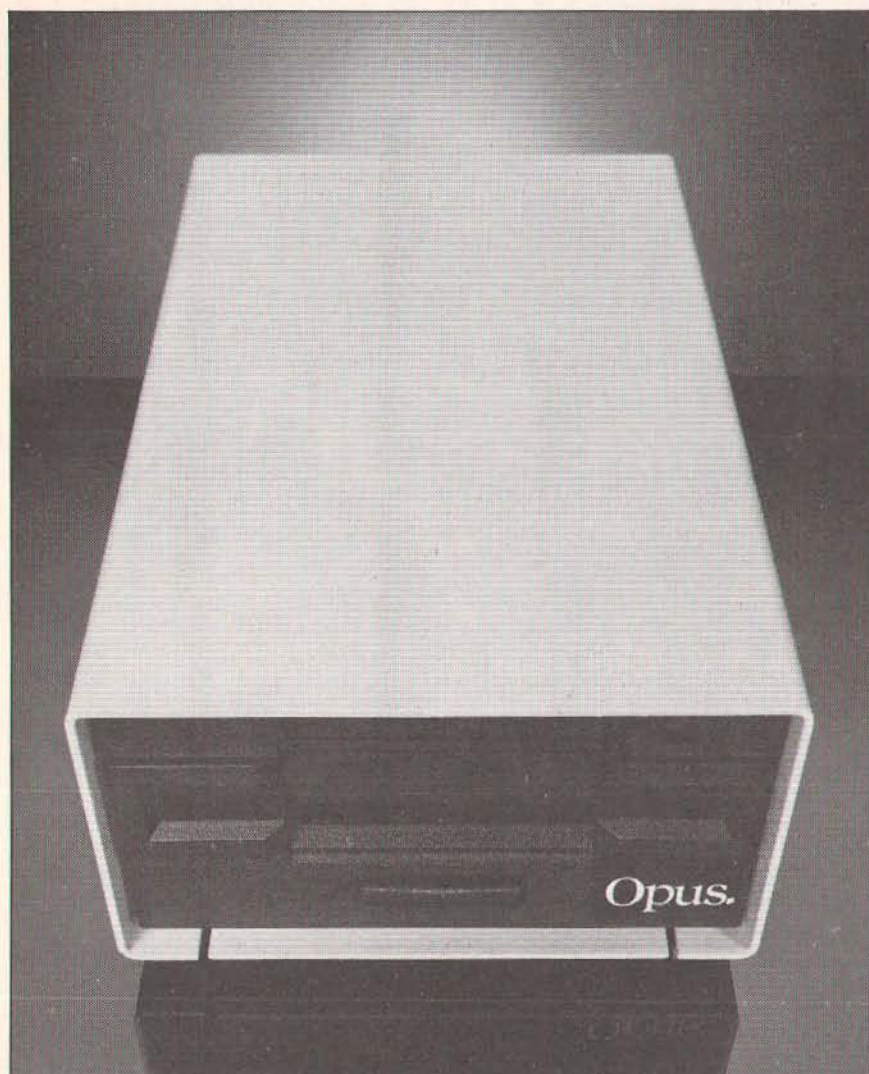
● Define all the special characters required in the printer itself. (OK if you have a printer in which characters can be defined - even the best printers find this task daunting if all possible teletext characters are to be translated.)

● Stay in Mode 7, but give the printer



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## From Page 57

the information it would have received from a screen dump. (*Not the easiest way, but a good challenge!*)

Basically, the method chosen for the program described here is to send a stream of graphics data for what the printers term an 8 bit graphics dump. The information for each character is sent as a series of 8 bytes.

For normal characters this information is found in a table in the operating system starting at &C000. This contains the definitions for the characters of Mode 0-6.

The characters which vary from Mode 7 are defined by the program and placed on page &C. The graphics characters are decoded according to their Ascii number and the definition put in page &C starting at &C10.

If any of these characters is to be double height, the single height character is "expanded" and the definition placed in page &C starting at &C08.

When characters are defined using VDU23, or are predefined in the

character table in the operating system, they are defined from top to bottom in rows in line with the way that the TV screen is normally scanned.

Printers however usually print *columns* of vertical dots to make up a character.

To translate these VDU definitions into a form which a printer with 8 bit imaging can understand, a short machine code routine is used as Basic would be too slow.

The output definition is also stored on page &C starting at &C00.

The program is designed to be compatible with Basic I and Basic II. If you only want to use this program with Basic II, replace line 1650 with:

```
OSCLII"LOAD "+file$+" 7C00"
```

and delete 1660 and 1670.

As written, this program works with Epson printers such as the FX80 and RX80. Conversion to other printers with an 8 bit imaging mode is possible by changing the commands in certain lines:

120 Tells the printer to expect 320 bytes of 8 bit graphic data.

280 Is concerned with the spacing between lines.

290 Commands for carriage return and line feed.

330 Command to reset the printer.

This program can be made to occupy less space in memory by saving the character definitions and machine code separately.

After the program has been typed in, tested and saved, clear the memory with:

```
*FX200,3
```

and press the Break key.

Load in the program and enter:

```
PROCinit
```

to define different characters and assemble the machine code on page &C.

Save these with:

```
*SAVE code C00 +FF
```

Lines 430-520 and 1060-1600 can now be deleted. Alter line 530 to:

```
*LOAD code
```

then save the shortened Basic program.

Remember in future that *code* must always be available for loading after the Basic.

## Teletext listing

```
10 REM Teletext Screen Dump
20 REM Jim Notman (c) 1984
30
40 MODE 7
50 PROCinit
60 PROCload
70 ON ERROR GOTO 320
80 VDU 2
90 PRINT
100 FOR YZ=0 TO 24
110 graph=FALSE
    :double=FALSE
    :separate=FALSE
    :close=FALSE
120 VDU 1,27,1,75,1,64,1,1
130 FOR XZ=0 TO 39
140 VDU 31,XZ,YZ
150 RZ=(USR (&FFF4)AND &FFFF)
    DIV 256
160 IF RZ>128 AND RZ<136
    THEN graph=FALSE
170 IF RZ=140
    THEN double=FALSE
180 IF RZ=141
    THEN double=TRUE
    :close=TRUE
    :PROCsetline
190 IF RZ>144 AND RZ<152
    THEN graph=TRUE
    :close=TRUE
```

```
200 IF RZ=153
    THEN separate=FALSE
210 IF RZ=154
    THEN separate=TRUE
220 IF (RZAND &7F)<33
    THEN FOR LZ=0 TO 7
        :VDU 1,0
    :NEXT
    :GOTO 270
230 IF graph=TRUE AND NOT (RZ=35
    OR (RZ>63 AND RZ<95)OR (RZ>191
    AND RZ<224))
    THEN PROCgraph(RZ)
    :GOTO 270
240 IF RZ=163
    THEN RZ=96
    ELSE IF RZ=223
    THEN RZ=35
    ELSE IF RZ=224
    THEN RZ=95
250 IF (RZ>90AND RZ<96)OR (RZ>122
    AND RZ<128)OR (RZ>218AND RZ<223)
    OR (RZ>250AND RZ<256)
    THEN PROCdiff(RZ)
    :GOTO 270
260 PROCprint(RZ)
270 NEXT
280 IF close=TRUE
    THEN VDU 1,27,1,65,1,8
    ELSE VDU 1,27,1,65,1,9
```

```
290 VDU 1,13,1,10
300 NEXT
310 VDU 26
320 IF JZ<41
    THEN FOR LZ=0 TO (41-JZ)*8
        :VDU 1,0
    :NEXT
330 VDU 1,27,1,64,3
340 IF ERR <>0
    THEN REPORT
    :PRINT " on line ";ERL
350 END
360
370 DEF PROCinit
380 AZ=135
    :pZ=&C00
    :mZ=&C08
    :bZ=&C000
390 DIM cmdZ 25
400 setline=-2
410 top=FALSE
420 bottom=FALSE
430 VDU 23,227,0,16,32,127,32,16
    ,0,0
440 VDU 23,228,64,64,64,76,82,4
    ,8,30
450 VDU 23,229,0,4,2,127,2,4,0
    ,0
```



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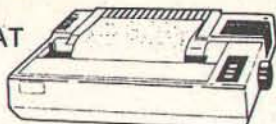
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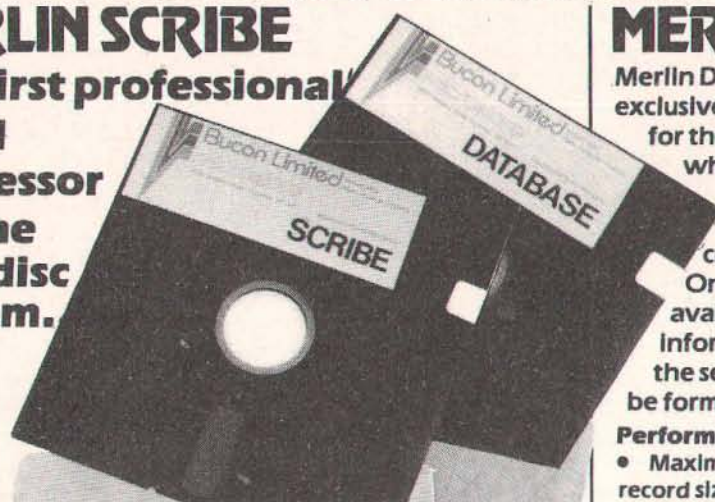


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**PETER JOHNSON describes the new assembly instructions available on the second processor**

# ***How to save both time and memory***

**THERE** are two obvious ways in which Acorn's new 6502 second processor gives the user more power. The first is its extra speed — the clock rate is 3MHz compared with the 2MHz of the I/O processor (the BBC Micro).

In addition, the second processor is interrupted far less frequently than the I/O processor as it has no keyboard or other devices to service. These factors result in a speed increase of 50-65 per cent.

The other powerful feature is the extra memory the second processor provides. There is 44k available to the Basic programmer when HiBasic is used and 60k available to machine code programmers.

There is also a less well-known extra that the second processor gives — an enhanced instruction set.

The 6502 used in the parasite (another name for the second processor) is not the common or garden NMOS version used in the host (another name for the BBC Micro!), but a souped-up CMOS version made by, among others, GTE.

The official designation for this chip is G65SC02, though there are other similar ones such as the 65SC12 which have the same instruction set but slightly different hardware characteristics.

The purpose of this series of articles is twofold. Firstly, it introduces the new 65SC02 instructions, explaining how they save bytes and microseconds.

Secondly it explains a way of assembling the new instructions using the HiBasic assembler directives.

I assume that the reader has a fairly good knowledge of the standard 6502, so I won't attempt to teach assembly

language programming.

Table I summarises the new instructions.

I have grouped the extra 65C02 instructions into eight sets of similar operations, or address modes, for the purpose of explanation.

Before I start with a detailed description of the 27 instructions listed in Table I, it should be noted that there are another 32 instructions available on the Rockwell R65C02 family of chips that do not appear in the instruction set of the 65C02.

Acorn seems to have chosen the latter chip instead of the more powerful Rockwell version because it is more easily available. Whereas several companies manufacture the 65SC02, Rockwell is the only source of R65C02 chips. It's nice to see that Acorn has learnt a lesson from the scarcity of 8271 disc controllers, whose sole supplier is Intel.

It can be seen from Table I that the 65C02 instructions provide both new operations and extensions of existing ones. I will describe the new opcodes by group — the first four this month, the last four next month.

## **Group 1**

This comprises eight existing instructions using a new addressing mode. This mode is zero page indirect and has previously been available only with some form of indexing.

Readers familiar with the standard 6502 instructions will notice that the eight instructions provided with zero page indirect are the same ones that currently allow post-indexed and pre-

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**SECOND  
PROCESSOR**



## From Page 63

indexed indirect modes.

With zero page indirect, the required byte is found at the address given by two zero page bytes. The location of the first of these zero-page bytes is given in the operand of the instruction. This sounds complicated, but compare the two sequences given below – they have the same effect:

6502	65C02
LDY#0	LDA (tmp)
LDA (tmp),Y	

In both versions *tmp* is the address in zero page of the pointer to the (address of) the desired byte. On the BBC running under Basic, *tmp* might have the value &70, as that is where the user's workspace starts.

At *tmp* and *tmp+1* there would be the address of the byte to be loaded. It can be seen that by using the new instruction, two bytes of program – required by the LDY#0 – have been saved. Moreover the Y register wasn't corrupted, and two clock cycles were saved.

### Group 2

A fairly small group this, containing only one instruction. Incredibly, the designers of the original 6502 instruction set didn't include an unconditional branch instruction.

This was unfortunate as it meant that 6502 programmers either had to use JMP, which is one byte longer, or branch on some condition that they knew to be true. If no such condition could be assumed, one was often invented. For example:

6502	65C02
CLC	BRA label
BCC label	

In the first example the CLC was executed solely in order to make the branch succeed. In the 65C02 version the branch is executed without regard to the condition codes.

The advantage of this is that code can be made clearer by having explicitly unconditional branches, rather than inventing some contrived "always true" condition.

Like the rest of the branch

instructions, the operand of BRA is a single byte which gives the displacement of the destination from the first byte of the next instruction.

This displacement is in the range -128 to 127, or -126 to 129 bytes from the branch instruction itself. A BRA &FE instruction will cause an infinite loop, and BRA 0 is effectively a NOP instruction.

### Group 3

This adds new address modes to an existing instruction. The action of BIT is to AND its operand with the accum-

ulator, setting the zero (Z) flag if the result is zero.

The accumulator is not affected. In addition, the negative (N) flag is set to the sign (most significant) bit of the operand, and the overflow (V) flag is set to the second most significant bit (bit 6, counting from zero) of the operand.

Usually the ANDing part of the instruction is ignored, and BIT is used to test the state of the top two bits of its operand. Out of interest, you may like to look at the possible values of A when the

Mnemonic	Operation	NVZC	Opcode	Bytes	Cycles
<b>Group 1</b>					
ORA (zp)	A=A OR M	N . Z.	&12	2	5
AND (zp)	A=A AND M	N . Z.	&32	2	5
EOR (zp)	A=A EOR M	N . Z.	&52	2	5
ADC (zp)	A=A+M+C	NVZC	&72	2	5
STA (zp)	M=A	....	&92	2	5
LDA (zp)	A=M	N . Z.	&B2	2	5
CMP (zp)	A-M	N . ZC	&D2	2	5
SBC (zp)	A=A-M-~C	NVZC	&F2	2	5
<b>Group 2</b>					
BRA rel	Branch by M	....	&80	2	3
<b>Group 3</b>					
BIT zp,X	A AND M	7 6 . Z	&34	2	4
BIT abs,X	A AND M	7 6 . Z	&3C	3	4
BIT imm	A AND M	7 6 . Z	&89	2	2
<b>Group 4</b>					
STZ zp	M=0	....	&64	2	3
STZ zp,X	M=0	....	&74	2	4
STZ abs	M=0	....	&9C	3	4
STZ abs,X	M=0	....	&9E	3	5
<b>Group 5</b>					
INC A	A=A+1	N . Z.	&1A	1	2
DEC A	A=A-1	N . Z.	&3A	1	2
<b>Group 6</b>					
PHY	Stk=Y Sp=Sp-1	....	&5A	1	3
PHX	Stk=X Sp=Sp-1	....	&DA	1	3
PLY	Sp=Sp+1 Y=Stk	....	&7A	1	4
PLX	Sp=Sp+1 X=Stk	....	&FA	1	4
<b>Group 7</b>					
JMP (abs,X)	PC=M	....	&7C	3	6
<b>Group 8</b>					
TSB zp	M=A OR M	N . Z.	&04	2	5
TSB abs	M=A OR M	N . Z.	&0C	3	6
TRB zp	M=~A AND M	N . Z.	&14	2	5
TRB abs	M=~A AND M	N . Z.	&1C	3	6

M is the memory location addressed by the operand  
X and Y are the 65C02 registers  
Sp is the 65C02 stack pointer  
Stk is the address &100+Sp  
~A means NOT A, ~C means NOT (the carry flag)  
NVZC means that flag is affected, . means it isn't  
7 means N is set to bit 7 the operand  
6 means V is set to bit 6 of the operand

Table 1



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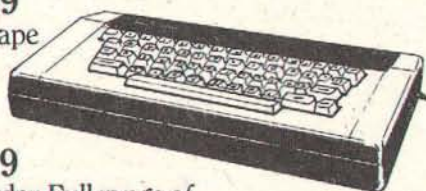
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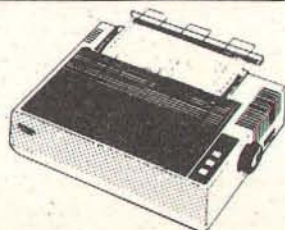
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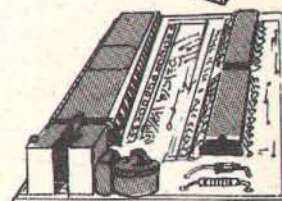
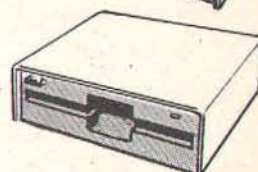
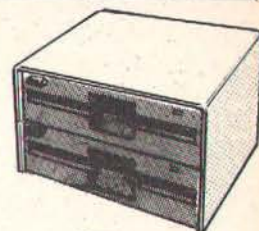
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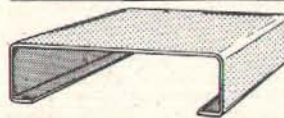
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## From Page 64

OSFIND routine is called.

The values were obviously chosen to make it easy to test the required file type using BIT. Similarly ROM-type bytes use bits 6 and 7.

The 65C02 enhancements to BIT provide three new addressing modes which are already available on other instructions. The first two simply add an index to the existing BIT address modes. This could be useful, for example, when checking a table of flags, looking for one with bit 6 and bit 7 set:

### 65C02

LDX#&0F	Check 16 entries	.next	DEX	Do next one
.loop BIT table,X	Check current byte		BPL loop	If we haven't passed zero
BPL next	Not this one	.fail	\ Print some kind of "Not found" message	
BVS found	Got a byte with Z=1, V=1	.found	\ We come here with X pointing at the entry if found.	

In this example *table* could be either a zero page location, in which case the instruction would take two bytes and four cycles, or an absolute location, taking three bytes and 4/5 cycles.

The last new BIT instruction, BIT immediate, has the operand following the opcode. A typical use would be to set the sign or overflow flags without altering any of the registers. For example, BIT#&C0 would set both the flags, and BIT#&40 would set just the overflow flag. The ANDing action to set the zero flag still takes place, of course.

Unfortunately there is a bug in the 65SC02 - the BIT immediate instruction does not set the sign or overflow flags correctly. Its use in this way should therefore be avoided.

## Group 4

The store zero instructions are very useful. They set the contents of their operand address to zero. An alternative mnemonic is CLR, which is the one used for a similar instruction on the Motorola 6800.

The zero page and absolute versions obviously affect one location. The two sequences:

6502	65C02
LDA#0	STZ total
STA total	

have similar effects. The 65C02 version has the advantage that it doesn't affect the accumulator or flags, is two bytes shorter and is two cycles quicker.

Similar advantages apply to the indexed versions. These may be used to clear up to 256 locations, with the advantage that the accumulator may be used in the loop for things other than holding the constant zero.

● Peter Johnson continues his assessment of the 65C02 instruction set in next month's issue of *The Micro User*.



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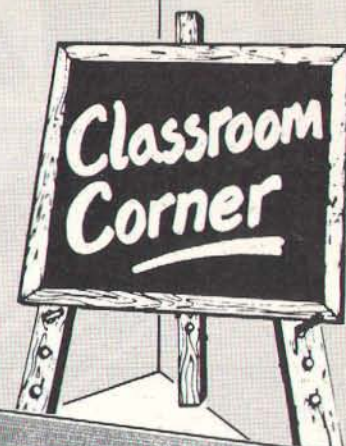
Date

 **Hitachi - in a word reliability**



A valuable maths exercise by PALI RAO

# Sign of the times (and addition, subtraction and division)



IN Number Signs a child is tested on simple subtraction, addition, multiplication and division.

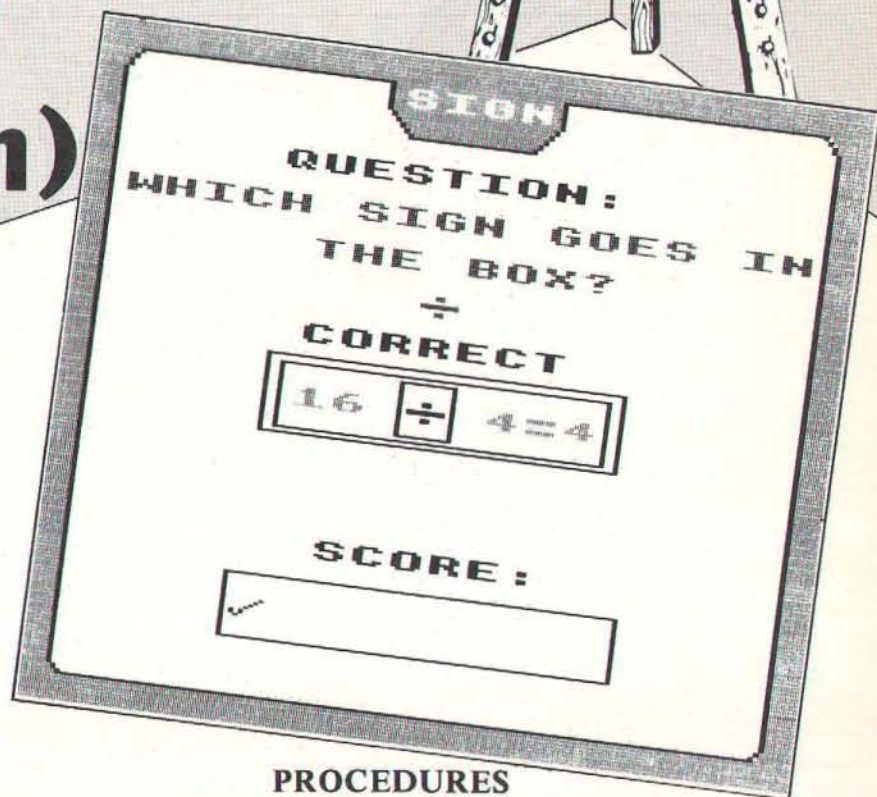
The program prints a sum with a box in place of the correct sign and then the child is asked to enter the correct symbol. If the child is wrong, the computer will tell him or her and also give the correct symbol.

If the question is answered correctly the score is incremented by one, adding up to a total out of 10.

The program uses the normal computer symbols \*, /, -, + for the mathematical functions, even where this requires the use of the Shift key.

However if the child fails to use Shift, the program will prompt accordingly.

The program uses Modes 7 and 2 and also involves the speech synthesiser when entering the name. But if you haven't got such a modification the program will still run normally.



## PROCEDURES

**PROCinit**  
**PROCinstr**  
**PROctune**

Initialises variables and also sets up the user defined characters. Prints out the instructions and explains the keys to be used. Plays a short tune and then causes a delay while the tune is being played.

**PROCname**

This procedure from *The Micro User* asks the user for his/her name. The speech synthesiser also asks the user but this will not have any effect if not fitted.

**PROCcalc**  
**PROCscreen**  
**PROCbox**  
**PROCmessage**

Calculates the values for the equation.

Sets up the screen, draws a border and box.

Draws the box in place of the numeric symbol.

Informs the user whether the symbol was correctly input or not and also prints out the correct symbol if necessary.

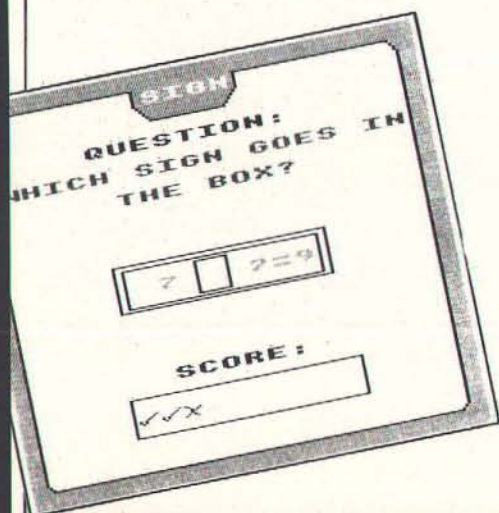
**PROCscore**

Tells the user the score obtained and gives an encouraging message depending on the score. This procedure also asks the user if the game is to be played again.

## VARIABLES

**TES**  
**X%,Y%**  
**SX,SY**  
**BX,BY**  
**delay**  
**SC**  
**A,B**  
**C**  
**AS**

Name of the player.  
Position of sum on screen.  
Position of tick/cross.  
Position of box on screen.  
Delay period for PROCdelay (a simple loop).  
User's score.  
Random elements in the sum.  
True result of the sum.  
Holds user defined symbols for -, +, ÷, ×



Listing starts  
on Page 147



# CHASE DATA

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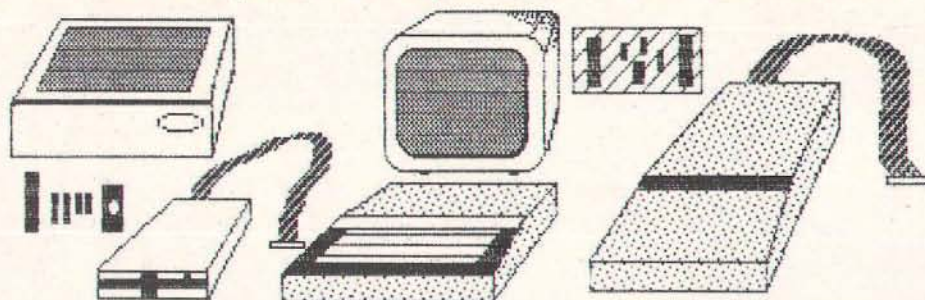
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# MIKE COOK'S PROBLEM PAGE



I HAVE recently purchased the Beeb Body Building Course packs 1 and 2 but I am unable to use them because I do not know how to address the user port.

I have inquired at my local computer shop, but all they seem interested in is selling games. Can you help me? The program I have to write is to turn on LEDs from a switch. — *Richard Mollett, Barkham, Berks.*

● It sounds as though you haven't got the back issues of *The Micro User* (July and August 1983). The accompanying Body Build articles explained this at length.

In short, writing to the data direction register will set up each bit on the user port for input or output. To set up bits 0,1,2,3 for outputs and the others for inputs use:

?&FE62=&0F

Then you can output to the port using:

?&FE60=A%

Or input using:

A%=?&FE60

## The cost of colour

THE BBC Micro does not provide a colour output from the BNC connector.

However Acorn's reply was to connect a 470pF ceramic capacitor on the underside from the emitter of Q9 between IC45 and the UHF modulator — BC239 to the base of Q7 next to the empty IC97 — BC309.

After trying this, I found that although colour presence was noticed it was far too faint. Is there any way to increase the colour intensity?

I also discovered while examining the circuit diagram of the BBC Micro from the Advanced User Guide that it is also possible to take an audio output from PL16 instead of

## Back issues provide the answers

using the speaker.

Another hint in *The Micro User* was a program for slowing down games — timed delay.

By typing:

?&FE45=1: ?&FE46=0

I discovered that the whole computer is slowed down. You can watch a mode change, characters being generated — all in glorious slow-motion.

This also shows that during a mode change you can just see two modes, that is changing from 2 to 7 will show disintegration of the video RAM and the appearance of Mode 7.

To revert to normal speed type:

?&FE45=11: ?&FE46=14

The value contained in these locations can be obtained by PRINT?&FE45, ?&FE46. — *Neeraj Sharma, Slough, Berks.*

● The trouble with this modification is the differing sensitivities of PAL decoders to the botched up colour signal that comes out of any computer.

To make this colour signal of a commercial TV standard would however double the cost of the computer.

To increase the intensity you could try increasing the size of this capacitor. So long as it is a disc ceramic type then you should have no trouble.

If you have another type why not put it in parallel with the first? This will effectively double the value. What it is doing is to

insert the chrominance component of the signal — the higher the value the more signal.

If you inject too much then the picture will be over saturated, but no harm will be done, so feel free to experiment to get the best results.

## Videoing a program

I AM trying to make a video of a computer program. Unfortunately I cannot link the output of the computer to the video directly as the frequencies of the input/output of video and modulator are the same.

Is it possible to alter the frequency at which the modulator outputs the UHF signal? The way I am getting round that — by using a video camera on the TV screen — is not very satisfactory, but it was improved by using a switch on the camera which inverted the picture from positive to negative.

Of course there were different colours on the video as a result but the picture was much better.

— *S. Taurins, Abergavenny, Gwent.*

● It is not the frequency of the modulator that is at fault. This can be adjusted slightly by altering the slug accessed through the hole in the

modulator box.

The problem is one of synchronising the computer's video output with that of your picture source.

What you need is known as a Genlock circuit. This alters the frequency and phase of your computer video to match exactly that of your other video source.

I only know of one source of these commercially for this or any other computer and that is from Video Electronics (tel: 0942 882332). However it will cost you nearly as much as did your computer!

## Is the crimp too thin?

I HAD problems last year with high resistance crimped connectors on three of the seven power supply leads — two of them within the power supply unit.

Since then I have tested nine PSUs, eight of them having potential faulty crimps, revealed by connecting a suitable resistor across each pair of supply wires in turn, to pass 2 amps.

Use a millivolt meter to measure the mV drop between OV on the PSU socket and the resistor end connected to the black wire.

A varying reading will indicate a fault at one of the two crimps at each end of the black wire. Similarly, connect the meter across the +5V socket of the PSU and the resistor end connected to the red wire.

In two cases the wire pulled out of the crimp. My opinion is that the wire is too thin for the size of the connector — which Acorn dispute.

I have also decoupled the

**You've got a problem with your micro and you just can't sort it out on your own? Then write to MIKE COOK. If he can't help then probably no one can . .**



IF you have a technical query for this page, send it to Mike Cook, *The Micro User*, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

Letters on other subjects should be sent, as usual, to Micromail, which this month starts on Page 177.

## From Page 75

+5V supply to the modulator which significantly improves the quality of the subsequent display.

In addition I ran a thicker lead from one of the PSU fixing screws and soldered the other end to the modulator case. Lowering the source impedance to the area in question also marginally improves the display fed from the RGB output.

You will also find it revealing to measure the mV drop along each of the leads with the computer powered. — D.P. Lawrence, Colchester.

● Thanks for your advice. I have come across this problem on some of the very early series 2 printed circuit boards but had assumed that Acorn had got that one ironed out.

## Boot up on power up

I HAVE looked at all my issues of *The Micro User* but I cannot find any reference to auto booting on power up.

I wish to use a BBC Micro for continuous monitoring of temperatures and require it to self boot should there be a power failure.

Can you help? — Tim Fryer, Milton Keynes.

● Your answer is on Page 93 of the January 1984 issue of *The Micro User*. Just make link 4 to change the auto boot option from Shift-Break to Break.

This will give a boot up on power up. (Note that diagram has holes labelled 1 to 8 and it should be 0 to 7.)

## Speaking of damage...

I HAVE tried through Micronet, Prestel, experts and micro shops, but nobody will give me an answer to my question.

As I order *The Micro User* through my local newsagent, and as I consider it the best micro magazine on the market I thought who else but the expert himself to answer my query?

I own a BBC Model B. If I were to cut the internal wires,

disconnect the internal speaker and attach the wires to two small hi-fi speakers to get a better sound, could you please tell me if this would lose any memory or do any damage? And would it affect games programs in any way?

You are my very last hope for an answer. It really is important to me because the idea of having two speakers on either side of the computer with improved sound, speech synthesiser and games would be very impressive indeed.

— Robert Grant, Gatley, Cheshire.

● Yes, you can do this. Wire the speakers in series and you should have no trouble.

## Simple cut is OK

I HAVE just installed a disc upgrade on my Beeb using the directions in your article in the January 1984 *Micro User*.

My computer has an issue II motherboard so I was expecting

to have to cut pin 9 on IC 27 etc, but I found that the IC was not soldered in. So I decided to remove it from the socket and bend up the pin.

Then I noticed that the track from S9 didn't seem to go anywhere under the socket, although on the reverse of the PCB pin 9 was joined to pin 7 by a wire.

I have simply cut out the wire and not tried to bend up the pin or cut the track. Do you think this will be OK? And can you tell me what the symptoms would be if not? — J. Clifford, Bracknell, Berks.

● Yes, this should be OK. The symptom of it not being OK is failure of the discs to work at all.

## Teletext... or Prestel?

PLEASE could you help me with two questions?

1. I have a teletext adapter with ROM. Is it possible to run an assembly program enabling the

ROM to work with a modem, and if so how?

2. I have a View ROM fitted. As I have an Acorn GP100A printer is it possible to convert the printer pad for the Epson printer to allow me to get out of the printer what the manual says, or can you possibly publish a program?

I would be most grateful as I cannot afford to buy an Epson printer. — R.B. Dingle, Hounslow, Middlesex.

● I think you are confusing teletext with Prestel. They are totally different systems having a common display format.

So the question of running the adapter with a modem does not enter into it. Unless of course you want to send teletext pages to someone else down the phone line.

View requires a printer driver to get all the effects available on a specific printer. These will slowly become available along with a do it yourself customising printer driver.

In the meantime if anyone has written one we would be glad to publish it.

# Cool it—with an owl!

AS I experience overheating problems with my BBC Micro—no doubt due to the sideways ROM board—it would appear sensible to improve the micro's ventilation.

Fans or other electro mechanical devices are, in my opinion, undesirable because of their noise.

However, suitably drilled holes in the casing should ease the problem. There appears to be sufficient gaps for the air intake around the tube and 1MHz bus plugs, but the airflow appears to be restricted by the upper casing.

If the upper casing or lid was drilled with sufficient holes the airflow would be improved.

One idea is to drill holes in the form of the owl to maintain the aesthetics of the micro, in the north west corner of the lid.

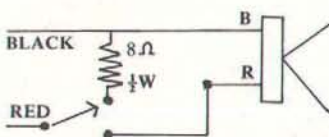
Before taking this irreversible step I would like your advice on the validity of the theory.

One other idea I would sincerely like to employ is to install a switchable dummy load

in the loudspeaker circuit.

This will enable my children to play their noisy games in the living room without irritating the rest of the family.

The circuit is simple enough:

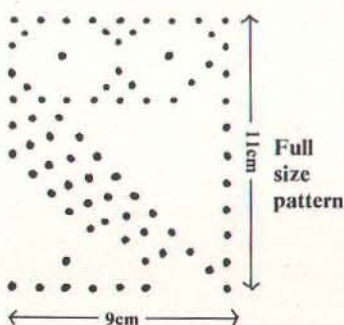


A most suitable position would be underneath the micro in the recess beneath the keyboard and alongside the name "BOOTHROYD". This would prevent the switch being accidentally knocked and gives plenty of room inside the micro for installation. Connectors should be used to enable the keyboard to be removed.

Lastly thank you for the best micro magazine on the market, it never comes out soon enough for me! — A.P. Randall, Weymouth, Dorset.

● Yes, drilling holes in the lid will help to solve your problem of overheating. I think it's a great idea to have the holes in the shape of an owl.

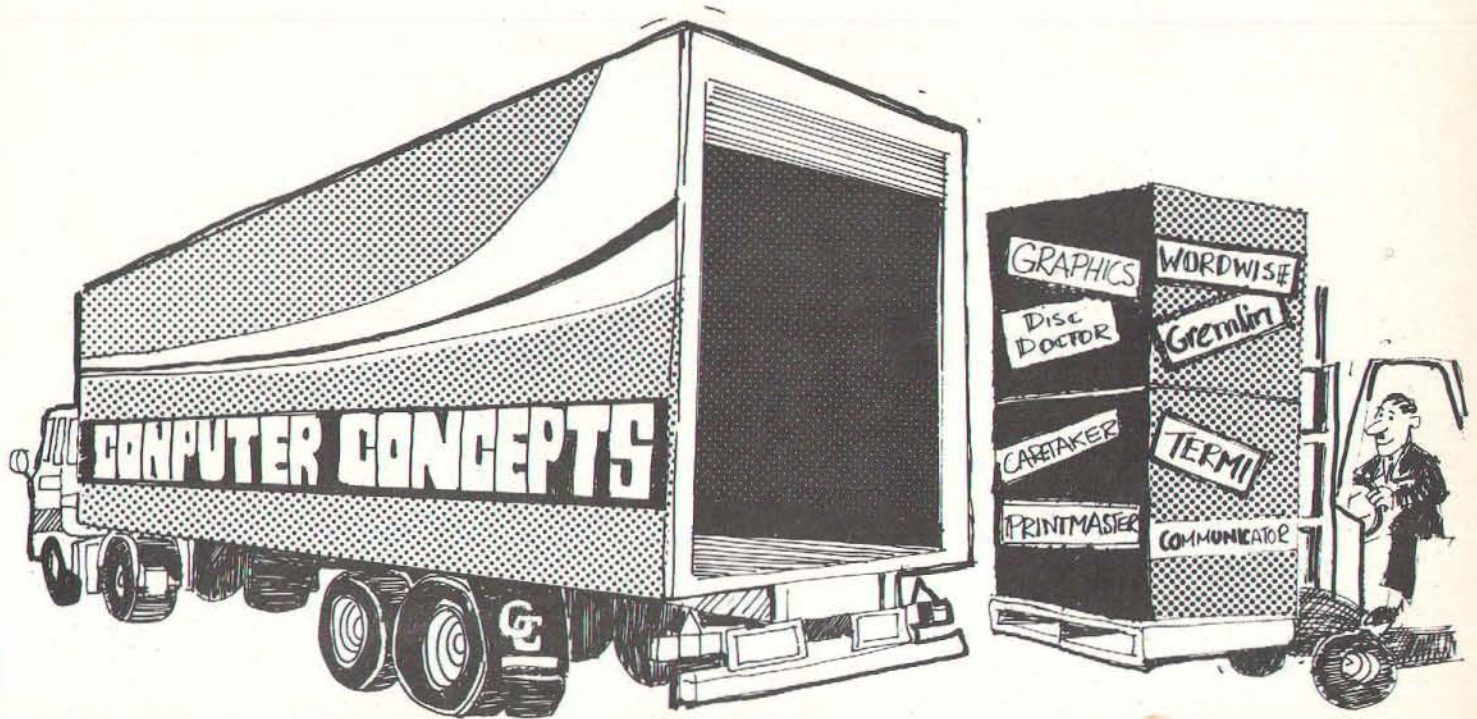
On the second point there is no need to include the 8ohm resistor—just switch out the loudspeaker. This was one of the first modifications I did on my own computer.



Underside of casing should have a thin loose weaved material or mesh glued to it, to prevent small objects dropping through the holes.



# We're on the MOVE



**To Gaddesden Place, Hemel Hempstead, Herts HP2 6EX**  
**Telephone: (0442) 63933**  
**On the 1st August 1984**

*Computer Concepts are expanding and require machine code programmers  
with experience of Z80/6502 processors.  
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# SATAN'S CHALLENGE

or (Nevil Rides Out) A Black Magic Adventure



Dare you take up the challenge laid down by the most evil and sinister of all beings . . . the devil himself.

If you do you will find yourself alone and at the mercy of the twisted fancies and whims of a cold and calculating mind.

Occult forces are threatening the lives of those near and dear to you. Their only salvation rests in your hands but in accepting the challenge your own existence is put in severe peril.

In taking up the challenge you have to find the TALISMAN and locate a pentagram which then has to be prepared for the final rite. In the mean time dark forces will be opposing you making a difficult task almost impossible.

Do not allow yourself to be lulled into a sense of security for it will be short lived.

Many have gone before only to swell the ranks of the damned.

This is the latest adventure from the stables of Microtest and has been written with the acclaimed features of other adventures in mind eg save facility, quick response, simple but extensive commands, a mixture of logical and fiendish problems to solve.

Be warned this is an easy adventure to get into but devilishly difficult to end.

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This exciting new ROM from Microtest will enable you to get all sorts of new characters and fonts from your BBC Computer. Once you have produced your masterpiece on the screen, all you have to do is use the inbuilt screen-dump utility to produce a hard copy onto paper.

Typing \*HELP FONTS\* gives a list of available fonts and the blocks of characters which they replace. Available fonts are:

- \*Accents Accents and miscellaneous.
- \*Block Small capitals.
- \*Data Like the bottoms of cheques.
- \*Greek It's all Greek to me too!
- \*Joined Standard capitals with joined up lower case.
- \*Maths A mix of until now unobtainable Mathematical symbols.
- \*Miscellaneous A few oddities which often are very necessary.
- \*Thick Thick text (for MODEs 0&3) to enhance 80 column mode.

### \*Thin

Thin text (for MODEs 2&5) which makes modes 2 & 5 much more readable or perhaps "READABLE".

### \*Vertical

For labelling graphs.

### \*MODE 8

Ten column multicolour, memory-miserly mode.

### \*S DUMP

A dump facility which will produce a screen dump of any MODE from 0 to 8 (including a text only dump in MODE 7) on an Epson, Star, CTI CP80 or MT80.

The ROM uses absolutely NO user memory and can be used with word processors etc. as well as normal BASIC programs. The DUMP utility will produce positive or negative graphics and will also rotate the picture produced through 90° as well as being able to position the picture anywhere laterally across the sheet of paper.

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Now available the Starstick ROM and Joystick. This comes in three forms:



*Enables you to use our joysticks on most programs even those that do not offer joystick capability.*

### (A) The Starstick ROM and Quickshot I Joystick

**Price 17.95 + VAT = 19.84**

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This enables you to plug the Rapid action self centring joysticks until now only available for the Spectrum/Atari/CBM machines into the user port of the BBC. Model A users please note NO ANALOGUE INTERFACE REQUIRED.

Disc Users Note - pressing BREAK, SHIFT-BREAK or CONTROL BREAK does not modify or destroy the STARSTICK software so Disc Users please feel free to Boot!

The software patch provided in the ROM is interrupt driven and adds the following commands to your computer.

- \* STICK turn on the STARSTICK ROM
- \* NSTICK turn off the STARSTICK ROM
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- \* SAVE "NAME" 140 160 saves your user-key protocols
- \* ADVAL emulate standard analogue joysticks
- \* PAUSE define key to Freeze game
- \* NPAUSE turn off ability to freeze game
- \* "NAME" predefined key protocols set up for software houses programs
- \* HELP KEYS displays currently selected key protocols
- \* REPEAT enables auto-repeat fire
- \* NREPEAT disables auto-repeat fire



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Large picture shows BBC Computer System and a Quickshot II Joystick. Small inset just a few of the joysticks that will work with the patch lead. Screenshot by kind permission of SUPERIOR SOFTWARE

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# Go Forth and Multitask!



ANOTHER GREAT  
FREE COMPETITION

THIS month we're giving away three of Skywave Software's Multi-Forth 83 ROMs – the latest language ROM for the BBC Micro.

Forth is the ideal language for the BBC Micro programmer who's looking for "something completely different".

Incredibly fast and powerful, Forth is not only easy to use, but it also guides you to structure your programs naturally. In fact you have no choice.

Also Forth allows you to define your own words. This means you can tailor the language to your own requirements by creating words to cover such things as plotting circles and so on.

In addition Multi-Forth has many features that make it the most advanced Forth available for the BBC Micro. Not only is it the latest version of Forth – the Forth-83 FIG standard – but it also supports multi-tasking.

This means you have several completely independent programs running on the same micro at the same time – up to 28 at once!

So, for example, you could have your micro listing one program while you're working on another – or you could be receiving messages via your modem while still using your word processor

program.

As you can see, the potential is enormous, so why don't you try to win one for yourself?

The competition must be the simplest

ever. You must have read Bob's letters to Trev in Micromail – all you have to do is to send us Trev's postcard to Bob. The funniest ones win – provided they're printable!

## JUNE CONTEST WINNER

WINNER of our June contest was Geoff Eisenhower of Ipswich, who receives a 6502 second processor for his efforts. The winning entry was:

*IN the beginning there was REPEAT. And the Lord Acorn said unto the first programmer: "As oft as ye shall use REPEAT so shall ye use UNTIL."*

*In this way ye shall go through any section of program as oft as ye shall choose.*

*On the first pass thy "counter" shall be known as one and on all other passes shall thy counter be known as "counter+1".*

*In this way shalt thou know how many times thou hast been through thy process.*

*But beware of the forbidden GOTO within thy REPEAT... UNTIL loops.*

*For, if ye shall eat of this forbidden command in thy loop, verily, ye shall be lost within the maze of eternal repetition. And on thy belly shalt thou go for the rest of thy PROCs.*

*And the fruit of the knowledge which cometh from the second processor shall be denied thee".*

```
10 REPEAT
20 counter=0
30 REPEAT
40 counter=counter+1
50 COLOUR counter
60 PRINT TAB(6,16)"COLOUR ";counte
ri" "
70 time=TIME
80 REPEAT UNTIL TIME=time+100
90 UNTIL counter=15
100 UNTIL FALSE
```

POST CARD

Dear Bob

Name

Address

Trev

Enter Trev's message to Bob on the left of the postcard (no more than 200 words), fill in your name and address in the space provided on the right, then send this coupon to: Forth Contest, Micro User, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.



# Hey Prestel. A new dimension for the BBC Micro.

Add the new Prestel Adaptor to a BBC Micro and you can download all programs available on the Prestel service.

Which considering Prestel is fast becoming a major software source, is a very attractive proposition indeed.

You can, for example, connect it to the growing Micronet 800 database. This

also enables you to access Prestel information on any TV or monitor. And store the data so that it can be displayed or manipulated how and when you require it.

What's more, the Prestel Adaptor turns your BBC Micro into a terminal that can link with other dial-up computers with 1200/75 baud interface.

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In fact, the enormous potential of our Prestel Adaptor, coupled with a surprisingly modest

price of £99 + VAT, make it a most exciting not to mention economical way to get more from your Micro.

The BBC Prestel Adaptor is currently only available via mail order.

You can order it on your credit card by ringing 01-200 0200 at any time, or 0933-79300 during office hours.

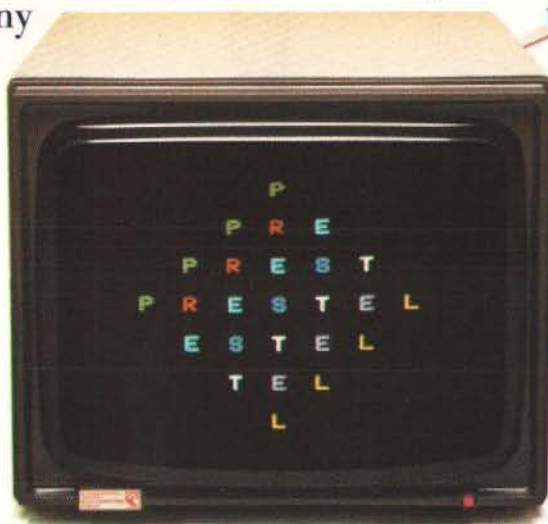
Alternatively, send off the coupon below.



gives you an extensive choice of educational and business programs. Other 'closed areas' for private company communications are also available.

And that's in addition to games that range from simple to sophisticated. Plus electronic shopping and banking facilities, and an extremely useful personal 'mailbox' service.

But that's only the beginning. The Adaptor



## Technical Specifications

For use with any BBC Micro 'B' with 1.2 MOS or later issue.

Prestel Language ROM supplied.

Dealer will install ROM together with MOS update if required in the BBC Micro.

Interfaces to any BT connection attached to 1200/75 baud dial up system (eg. Prestel, Micronet, Telecom Gold).

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Connection via RS423 serial port.

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BU9

## The BBC Microcomputer System.

Designed, produced and distributed by Acorn Computers Limited.



ONE of the favourite settings for an adventure is a deserted spaceship. I can only think of one book which begins in similar fashion – namely “Tiger Tiger” by Alfred Bester.

It's an interesting story because not only does the hero have to escape from the wrecked and empty spaceship but he also has to rediscover his ability to jaunt – that is, to travel through space by thought alone.

To achieve this he has to locate a number of objects and people, whom he interrogates telepathically, travel through a maze called the Gouffre Martel, open a safe and eventually distribute around the world an incredibly powerful substance which caused the original Big Bang and can be exploded by anyone just thinking about it.

The moral that we are all responsible for, and in the front line of, a nuclear war was made quite clear.

Unfortunately adventures are nowhere near this thought-provoking level, partly because the complexity is beyond the modern micro and programmer and partly because originality is rarely profitable.

Consequently space adventures almost always feature a cryptic computer, lifts that don't work, doors that won't open, engines and generators to be mended and shuttles to be flown, plus the occasional space suit to locate.

Robots are almost constantly on the prowl and the dilithium crystals can only be mined at the end of an underground maze – tough luck if you forgot the spade or the gadget to fix the drill.

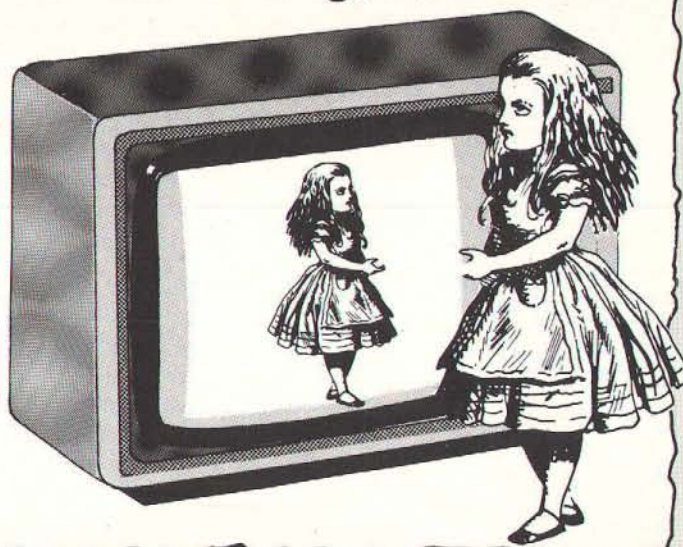
The Five Spheres of Goliath by Kansas is the fifth deserted spaceship I have encountered. The main difference is that this one has sound – you get Melvyn Bragg's theme tune by Paganini as your predicament unscrolls.

The first problem is to escape from your cell. This is *quite* a problem because, although you know the ship is at rest – Einstein steps back in amazement – I had to search the cell before I could find the bed and mattress I had just been sleeping on and then I couldn't climb on it or go up.

The next problem was to repair the generator accompanied by a nice sound effect that fades as you move away.

I stood there admiring my

## Alice through the VDU



Our monthly foray into Adventure games

# Space venture to the music of the spheres

handiwork. It would have been a neat trap to have the sound deafen me had I stayed too long, but, as usual, I knew I was safe because I had taken the hint that “There are more things in heaven and earth, Horatio” and (look it up) “if we list”, followed by GOTO 140, the program can be read and restarted. Actually I needed this because the SAVE wouldn't work.

Apart from the generator I found the lift and car sound effects a bit tiresome. I hate waiting, and there is a deal of going to and fro to get the coins to get the balls to get the wire to open the safe, and so on.

You have 500 moves to save the ship. I didn't manage it first time – the cryptic clue “Put the E between 1 and 3” baffled me.

Note that it does add more interest to have a move or time limit, and I eventually finished in 245 moves (PRINT T1%). I'm fairly sure that can't be beaten.

You can phone Kansas for help “when you get completely thwarted – and you will”. It surprises me that

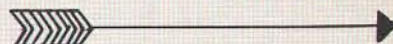
people write in asking me to help when almost every manufacturer is delighted to answer questions – it gives them an idea of their market.

Incidentally, Level 9 now issues hint sheets which I can thoroughly recommend. They contain hundreds of clues cleverly mixed up and you can actually play the games in reverse – that is, reconstruct the game without buying the program!

In Startrek by Superior Software you are on the bridge of the starship Enterprise. North is the radio (Uhurules), south is the helm (Sulules) and west is the science computer (Spockless, but with button).

As usual everyone's left you and nothing is working, so go east into the lift which is dark and has a slippery floor. Some zealous midshipman has holystoned it into a death trap (until you get the lights on?). Make a note in the log to have him keelhailed.

You have a choice of five levels – Armoury, Transporter, Exobiology,





## From Page 81

Engines (Scotty couldn't take it any more so he's gone, too) and Hanger, where there is a working shuttle.

Your mission is to get the dilithium crystals, new sensors and navigational computer and rescue Spock (surely they mean Kirk) from the Klingon ship just off the port bow. He's in room 84 – the Klingon brig.

To help you further the crystals are in room 63, the sensors go on the hull of the Enterprise – room 89 – and you have to steal the Klingon's computer from room 86.

There are two ways out of the ship – the transporter and the shuttle – one of which takes you to a flat plain (never seen a hilly one), which needs excavating, leading through a forest maze to a mountain which you can only climb if you have the right gear. Then you have to break into a maze of tunnels and off to work you go.

There are 101 rooms, the last of which does not contain the worst thing in the world. All in all a nicely thought out, logical game for Star Trek fans.

Having said something nice about a Superior Software game I'm afraid I must criticise their Lost City – it's by different authors and downright dull to play.

I have seen a good review of it that couldn't even get past the *first* problem – how to get out of the valley (WEAR BOOTS, CLIMB MOUNTAIN).

There are about 40 rooms – I worked that out from how the program scores – and it's quite tricky to see how you move between them.

Built into the room descriptions are the key words to get you to the next room.

You have to say OPERATE DRILL or you're stuck by a rockfall and EXCAVATE SPADE – what's wrong with USE and DIG?

Also the password appears to be randomly chosen from six words and the clue is the "cryptic words REMEMBER THE ICE" which is not cryptic.

So much for games I can solve but, even with MZAP, the machine code adventures make life difficult. Bob Redrup has been very helpful with Twin Kingdom Valley, having progressed to almost 900 points. He sent me a neat map laid out as described in my Hobbit article and "The Guide to Playing the Hobbit".

The sick giant is the answer to a lot of problems – free him, give him some-

thing, then move and wait. Most of the time he will follow you.

Lead him to Watersmeet, which cures both of you if you are weak. He can now help you to carry things but he is a bit greedy and tends to grab anything in sight.

With his help you can eventually enter the Large Hollow Chamber and reach the River of Gold and the Secret of Life.

I was stuck in the Wheel of Fortune so I wrote to Epic and got my legs smacked for being stupid. Surely I "should realise that a penny is worth more than an old boot", but I climb mountains in old boots and a penny ain't what it used to be.

I am currently rummaging at the bottom of the well (there's a ladder in the hut) but I'm not very intrigued by 250 rooms, most of which are "on a road", "by a well", "by a hut", etc, and the Mode 7 pictures aren't much help.

Nevertheless Epic has put a lot into this game and kids should enjoy it because it's random, freewheeling and illogical.

All my adventures are totally logical, so now for the solution to the Trap Door Maze in the May issue of *Micro User*. I called it that because it is not certain that you can return immediately to a room that you have just left.

Nevertheless the odds of never being able to return to Room 0 are about 1 in 10. This room does connect to all the others, so the game is solvable in practice.

Most people had no trouble with the first part – you GET all the objects and then leave a trail (AXE, BOTTLE, CORK, DAGGER, EGG, FEATHER, GUN, HELMET, ICON)

at each new (empty) room. You then GET JEWEL, tumble randomly back to Room 0, collect all the other objects and drop them in Room 0.

Everything disappears and the maze reconfigures, but now you can use SCORE (try it) to find your way to the money. Note that every time you TAKE the \$1,000,000 the maze will reconfigure and you are dumped back in Room 0. Nobody realised that you can use the money as a marker – just once.

Drop the money in Room 0 – which can always be reached by random moves and is now identified – and so for the long haul.

Imagine how easy the maze would be if you were ever told what exits were available as you enter a room. You have to work this out for yourself by careful choice and cautious move.

This steady, logical mapping requires clear thinking and patience to eventually get to the EXIT, take it, tumble back to Room 0, get the money and win.

Nobody worked out the final twist, but the nearest was S. Chmiel who, encouraged by our excellent prize, sent in a two-page explanation. If he can open the MOD2HEX safe he'll have to change his name.

This month's totally logical game has you in charge of the Filthy Fifteen – the toughest, most unsociable bunch of prisoners ever jailed. They can't stand each other for more than a night.

You have five cells and all you have to do is keep them happy for a week to win promotion. I'm looking for how you work out a solution rather than just an answer to this schoolgirl problem.

Alice

```

10 REM THE FILTHY FIFTEEN
20 DIM P(15,15),N(15)
30 FOR I= 1 TO 15
40   N(I)=1
50   FOR J=1 TO 15
60     P(I,J)=0
70   NEXT J
80 NEXT I
90 FOR night= 1 TO 7
100 PRINT"NIGHT ";night
110 FOR cell = 1 TO 5
120   PRINT"CELL ";cell
130   INPUT "The 3 prisoners are "
    ,X,Y,Z
140   IF X=Y OR X=Z OR Y=Z THEN PR
INT"DON'T CHEAT":GOTO 120
150   IF N(X)=night AND N(Y)=night

```

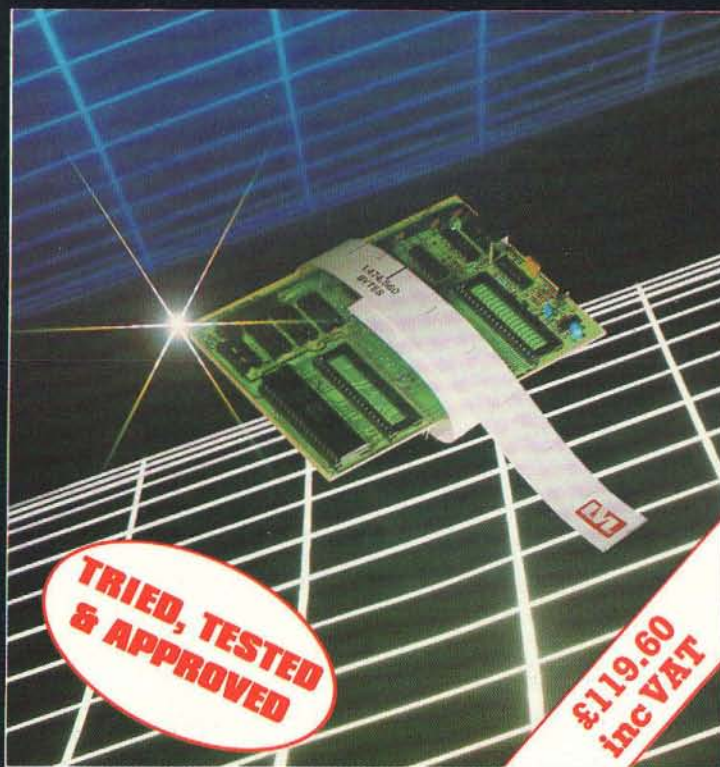
```

AND N(Z)= night THEN 170
160   PRINT"PRISONER ALREADY LOCKE
D UP":GOTO120
170   IF P(X,Y)+P(X,Z)+P(Y,Z)=0 TH
EN 190
180   PRINT"PRISONERS REFUSE TO SH
ARE A CELL AGAIN":GOTO120
190   N=night+1:N(X)=N:N(Y)=N:N(Z)
=N
200   P(X,Y)=1:P(X,Z)=1:P(Y,X)=1:P
(Z,X)=1:P(Z,Y)=1
210 NEXT cell
220 PRINT"DAY BREAKS AND NO RIOT S
O FAR"
230 NEXT night
240 PRINT"WELL DONE YOU ARE PROMOTE
D GOVERNOR":STOP

```



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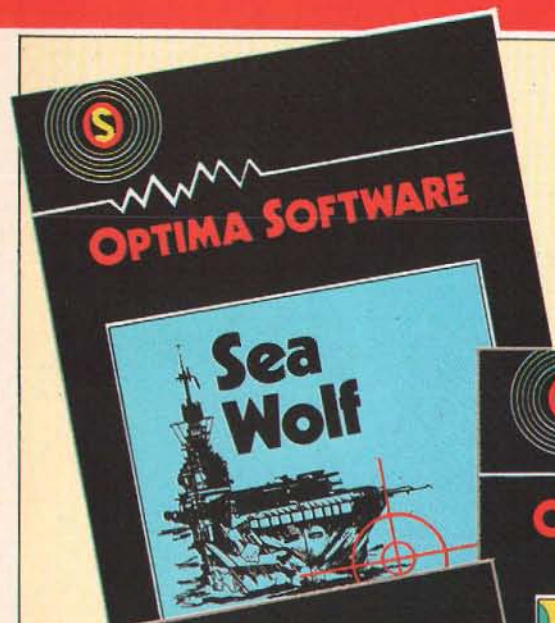




# OPTIMA SOFTWARE



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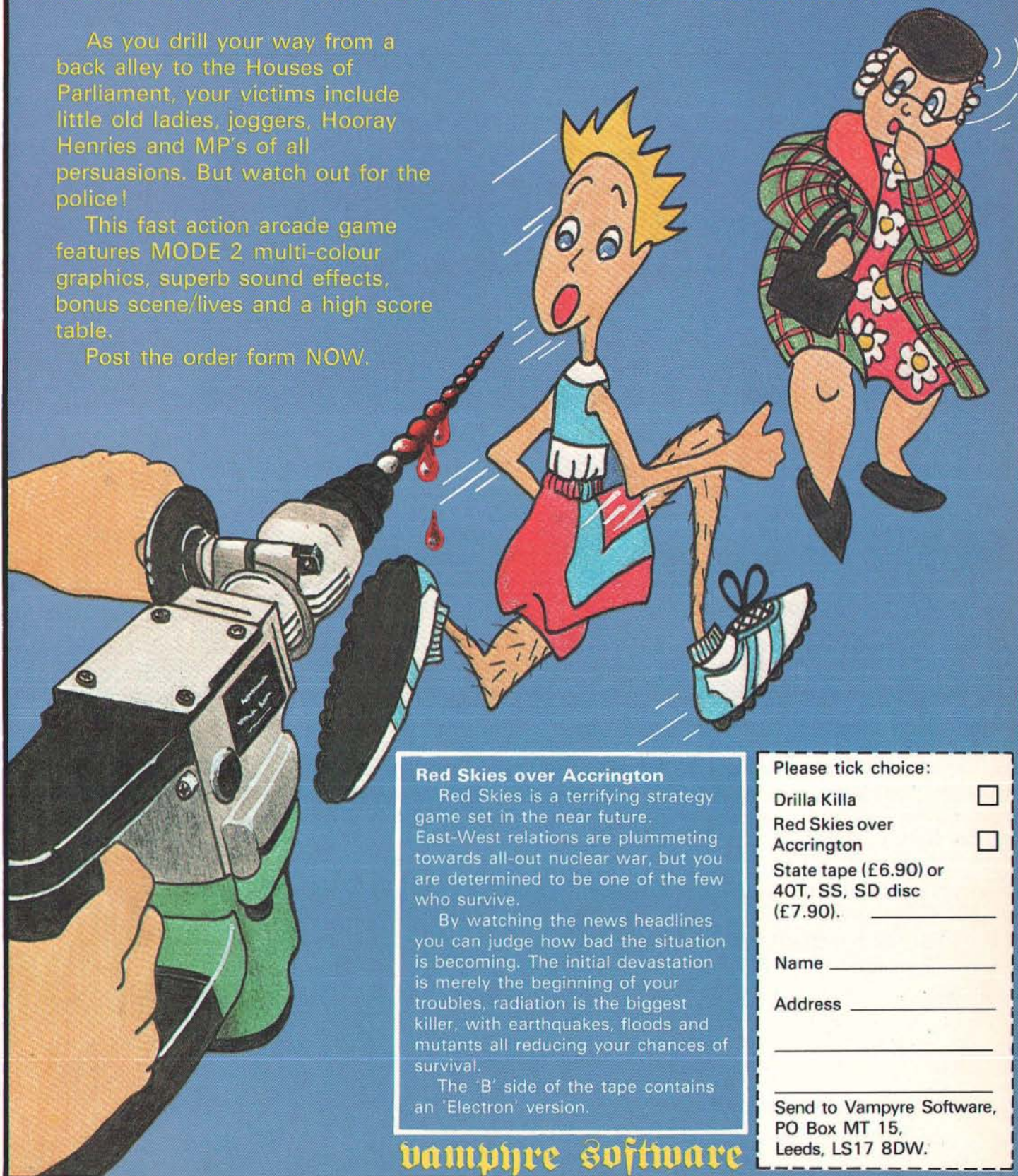
# DRILLA KILLA

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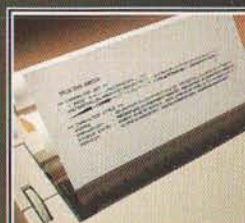
**vampyre software**



# Little Brothers should be seen but not heard.



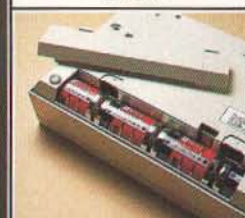
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A maxim which eloquently describes the Brother HR-5.

Less than a foot across, it's nonetheless loaded with features.

But there's one thing the HR-5 won't give you. Earache.

For the annoying 'clickety clack' many printers produce is mercifully absent from the HR-5.

Quietly efficient, it delivers high definition dot matrix text over 80 columns at 30 characters per second (maximum).

The HR-5 also has something of an artistic bent.

Being capable of producing uni-directional graphics and charts together with bi-directional text.

It will also hone down characters into a condensed face, or extend them for added emphasis.

Incorporating either a Centronics parallel

or RS-232C interface, the HR-5 is compatible with BBC, Spectrum, Oric, Dragon, Atari and most other computers with these interface options.

Perfectly portable, the battery or mains operated HR-5 weighs less than 4lbs, and has a starting price of only £159.95.(inc.VAT).

Which is really something to shout about.

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# Life was quiet, until the mutant lobsters...

THE year is 2005, Earth has been devastated by a nuclear holocaust and the few remaining members of the human race have been forced back into an old way of life as cavemen.

Life was quiet until the mutant lobsters turned up.

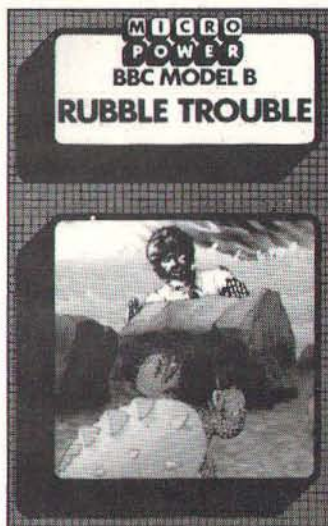
In **Rubble Trouble**, you pit your wits and strength against ever increasing numbers of these flesh eating lobsters known as Krackats.

When the game begins you are in a maze of boulders which you can roll about to crush the crustaceans.

You may be thinking that this is just another Pengo type game, and you would be right. But there is one very clever variation.

Should you push a boulder towards a Krackat and miss it you had better be nimble, because these boulders bounce!

On many occasions an itchy trigger finger left me chewing rubble and watching another little caveman, complete with halo, floating upwards to that



great gravel pit in the sky.

One by one the rocks disintegrate. This, along with the increasing level of radiation, provides the game with a time limit, bonus points being awarded for a quick clearance.

The boulders come in three types. The first are common or garden rocks. The second blue in

colour, are worth 150 bonus points when crushed. Finally come the flashers, to be avoided at all costs as any attempt to roll or crush one results in a nuclear explosion.

Should you tire of this maze there are two further options. First there is the hayfield in which the maze paths are filled with illusionary boulders which can be walked through without the need to crush them, leaving a clear path behind.

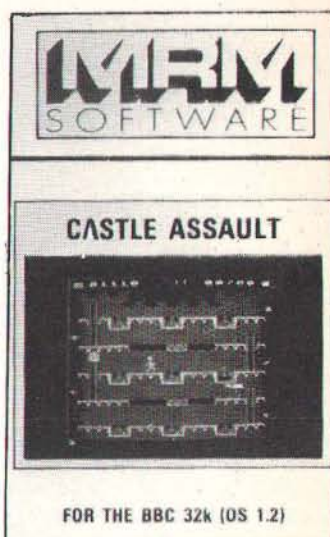
By disguising the maze layout in such a way, rolling boulders and escaping Krackats can be a very risky business.

Finally comes the invisible maze, where the rocks are invisible except when rolling. Not for the novice.

Excellent graphics and good use of sound combined with a well implemented twist of an established theme kept me at the computer until 2am.

Micro Power has got yet another winner.

Jon Revis



## Low price - but still a challenge to the ace

**CASTLE Assault** is the first MRM game I have played, MRM being a fairly new name in software for the BBC Micro.

Anybody who has seen their advert for software at £5.70 must, like me, have thought the price was a reflection of the quality.

However as soon as the tape had loaded I was proved wrong.

The game description was well presented and the instructions equally simple. After tapping the spacebar I was playing.

The screen layout was a castle split vertically into layers. I was a figure standing on the bottom level of the five.

Three of the levels were the same, consisting of three smiling crabs sitting in sunken boxes, each crab jumping in succession. The other two levels had a moving walkway as their obstacle.

Firstly the crabs have to be leapt while they're not leaping and bonus fruit can be collected from the ladder end of the first four levels.

After eventually passing the crabs, you face the moving walkway which is even more

# Rescue your loved one

**SPOOKS and Spiders** is an attractive and incredibly frustrating game.

You have to guide a silly little man through the haunted corridors of a prison to find and release "beautiful" damsels in distress who are being held prisoners behind one of the many cell doors.

To rescue his sweetheart, a key must be obtained to open the cell in which she patiently awaits her knight in shining armour.

This key is to be found hanging next to a door. To reach it a series of obstacles must be passed. For instance, giant spiders and irritating ghosts prowl the corridors acting as guards.

They can be avoided by a well aimed leap which is easier said than done. An accurate jump will clear them but experience is a must if you want to complete the first of the three stages.



If you are lucky enough - sorry, skilful enough - to gain possession of the key, great care must be taken not to bump into walls, ghosts or spiders for you will drop your key and use up

one of your three valuable lives.

A series of ladders takes you to different levels in the prison.

Once you have successfully opened all doors and rescued your loved one, you will jump for joy and pass onto the next phase - which seems more impossible than ever. The ghosts will become skulls and the whole game gradually turns you into a nervous wreck.

This is a difficult, but very enjoyable game which becomes compulsive since you always think that such a low score as your last can easily be beaten.

The skilful selection of colours and graphical displays used by Software Invasion make the game very presentable. My only criticism is that a wider range of sound could have been used to make it more entertaining and lively, although the sounds used are acceptable.

Mark Freeman



## From Page 87

difficult. You have to jump on, run along, then jump off the platform as it oscillates from side to side.

I persevered, and eventually made it to the gold on the top level and so graduated to the next stage.

Stage two has the same basic layout — a change would have been nice — but the crabs are replaced by coiled snakes, boulders fall from the ramparts and a duck sometimes seen on stage one flies around, causing havoc if met on the same level.

In the unlikely event of reaching the gold again, a bonus man is awarded, the snakes turn into another leaping beast (there are six in all) and the usual increase in difficulty is encountered.

As you have probably guessed the game is a mixture of Hunchback and Killer Gorilla. The game runs at the same speed as Killer Gorilla, a little slow, and needs a high degree of accuracy in jumping like Hunchback.

The keys are the standard Z X

\* ? with Return to jump. The sound is very arcade-like but unfortunately the man's steps lacked sound, as did the walkways.

However, the graphics are pleasant with well defined characters and clear movement.

The author has included the usual features including a high score table, a sound on/off during play and a pause facility. The status of the sound and pause is displayed on screen.

One annoying thing is that on hitting Break, in anger or by accident, the memory is cleared and the game has to be reloaded. I have noticed this on other games and I don't approve.

The game is of high quality, and represents excellent value for money. It's fun to play, if a little tricky at first, and needs a technique to be mastered for the crabs and walkways, more prayers for the ducks and boulders.

Personally, I would have preferred the game faster with easier jumps, but I strongly recommend it for the games ace looking for a challenge.

Andrew Smith

## Good features, but it's too dear

**KEY Definer and Character Generator** from GSOFT allows you to load from tape or disc a set of function key definitions, and makes it easy to define the user defined characters.

Taking the second first, a 3.2k Basic program presents an 8 by 8 grid of red asterisks. You move around the grid by using the normal cursor movement keys.

Whenever you make a move the asterisk in the new position turns white, showing that the pixel concerned is now "on".

If you want to turn it off you must also press the spacebar.

I would have much preferred the opposite, more conventional method where the current pixel is not turned on unless a separate key is pressed, because in practice you will want more pixels off than on.

If at any time you press the Return key the shape you have designed so far appears on the screen and the eight numbers for the corresponding VDU 23 statement are given.

This allows you to easily

design the character, and saves tedious calculation. (See pages 171 and 384 of the User Guide.)

A good feature is that the definition can be saved to tape or disc and reloaded into the BBC Micro's memory, although if you want to include it in a Basic program you must naturally reproduce the VDU 23 statement manually.

All the instructions are on the screen and they are very clear. The program is very easy to use and achieves its objective.

To use the function key definer, simply type \*LOAD KEYS. This can be done without affecting any program already in memory.

Pressing key f0 will then allow you to use a printer a bit like a typewriter (mistakes on the screen deleted by the Delete key will be printed), f5 and f6 will give the current value of PAGE and TOP respectively and f9 will

## QUICK RUNS

A first look at some of the latest releases

**Spitfire:** A flight simulator. Test your skill and concentration as you fly your fighter through a series of realistic and exciting manoeuvres, including take off, landing and looping the loop. Alligata.

★ ★ ★

**Denis Through the Drinking Glass:** In this zany text adventure you take on the role of Denis Thatcher whose aim is to avoid Maggie, overcome all the horrors of the political jungle, and reach the haven of the Gravediggers Arms. You'll meet them all on the way — the Royal Family, Ian Paisley, even the Pope. Every location is described in rhyme. Applications.

★ ★ ★

**Blogger:** As Roger the Dodger, master burglar, you work your way through several buildings searching for golden keys and emptying safes. As you rip off shops, houses and banks be on the alert

for many obstacles and spooky nightwatchmen. Alligata.

★ ★ ★

**Neanderthal Man:** In your endeavour to survive in a hostile land full of prehistoric animals, you must feed your family by returning to the cave and throwing food. Use your spear to kill predators as they menace you and your offspring. Alligata.

★ ★ ★

**Contract Bridge:** In this micro-simulation of the real game designed for one player, the computer bids the other three hands and plays your opponents' cards after the first trick. The program includes full instructions in conventional bidding and a running score sheet. Alligata.

★ ★ ★

**Sea Adventure:** You were sailing in the South Seas when your boat was holed

by killer whales. You are now adrift in this Mode 7 text and graphic adventure and trying to return safely to England. All movement is made using the function keys for single entry. Virgin.

★ ★ ★

**Brainbox:** In this two player strategy game you must attempt to wipe out your opponent's brain using a laser beam. You direct the beam at him by positioning deflecting prisms according to certain preset rules. Randomly placed prisms interfere with your plans. Virgin.

★ ★ ★

**Web Runner:** Try your skill and reactions as you attempt to escape from an enormous spider's web after planting a bomb in each corner. You will be chased continuously by a motley bunch of flies, spiders and centipedes which you can only eliminate with your laser. Alligata.





give the Ascii value of any key pressed.

The rest of the keys will do simple things such as CHAIN or SAVE a program. There is not much value in this part of the package, and it is rather a stocking filler.

Both programs transfer to disc easily and the brief documentation is adequate.

However there are other character definers available which are comparable and much cheaper than £9.95.

Norman Kirkby

# Realism is the key!

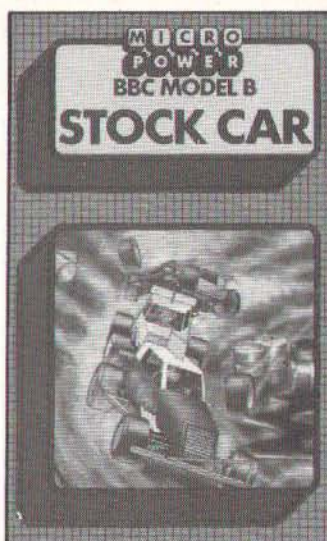
STOCK Car is yet another new title from the prolific Micro Power software house.

In this game you take on the role of a stock car ace pitting your wits against three computer controlled cars – two in the two player game – as you power your highly tuned machine around a choice of six circuits.

The aim is to achieve the fastest average lap time for any of the circuits, the current records being displayed in the high score table.

Once loaded, the game can be set up to your own requirements by setting the number of players, choice of circuit, number of laps, and finally the degree of skid required.

This last factor is the one which provides the game with its realism. I found that when using a skid factor of 20 per cent the car was a dream to drive – the skid factor is not necessarily a disadvantage. By beginning to turn just before entering a corner the car can be drifted rally style



around the bend.

Great fun can be had by blasting down the outside of the straight in top gear and then cutting across and taking the inside line through the bend, passing some computer controlled dummy who has left you the smallest of gaps. Yet another

computer car "bytes" the dust.

Once you think that you've mastered the game, try it with the oil slicks. These appear randomly around the circuit. Once every car has passed them the slicks vanish and reappear somewhere else. Quite often somewhere else just happens to be directly in front of your car.

To say handling is impaired when passing through a slick is a bit of an understatement, you would have more control driving on ice.

Taking a peek at the computer's cars, while grappling with the controls in the middle of an oil slick, I noticed that they appeared to pass through the oil without a waver. I can only assume that they were fitted with tyres of a different rubber compound to mine.

My first impression of the game had been one of disappointment with the graphics – the user's car being the only

**Frak:** Move Trogg the cave man around by climbing ladders and jumping rocky ledges as you search for golden keys to progress to the next level. Avoid at all costs the flying knives and floating balloons. Various nasties you will meet can be thwarted with your Yo-Yo! Superb graphics. Aardvark.

★ ★ ★

**Caesar the Cat:** Using keyboard or joystick you try to get Caesar to clear the larder of mice by catching them and taking them through the door. As they eat through the larder's contents and flit about on the shelves you must avoid knocking down crockery. Mirrorsoft.

★ ★ ★

**Football Manager:** Take on the role of a football manager as you strive to achieve promotion from Div 4. Using an on screen menu you can swap between

buying and selling players, selecting your team, viewing the fixture list or league table, and playing the game. You can even watch graphic edited highlights as the teams battle it out. Addictive.

★ ★ ★

**Manage:** In this interactive management game for two players you make decisions that will influence your opponent's market. Users will learn the significance of pricing policy and the correct allocation of cash resources. CCS.

★ ★ ★

**Mystery of the Java Star:** Four part adventure with each part loading separately. You can only progress to the next part when you are successful in the previous one. The object is to search for a shipwreck and in it find a ruby called the Java Star. The game climaxes in a

real time search of the sea bed with restricted air. Shards.

★ ★ ★

**Frac Attack:** An educational package of six games based on the understanding of fractions. Options include Shady Fractions (estimate the proportions of shaded squares), Frac Attack (shoot the wrong answers and rescue the right one), and Hungry Radish (find the biggest fraction or get eaten). Shards.

**Arena 3000:** It's the year 3000 and as a mere humanoid you take on waves of mutants in the entertainment arena. Moving around the screen under key control you fire your death ray in the direction of travel. The mutants only die after being hit several times, but you die from their slightest touch. As you clear each wave a different one arrives to take up the challenge. Microdeal.



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Program CHR 782

64 0 O A C T E S O  
72 H I J K L M N O  
80 P Q R S T U V W  
88 X Y Z [ \ ] ^ \_ `

Key L to list MENU

GRID 76543210-0123456789

DRAWING (8-10) 2  
Duplicate grid Not

Key L to list MENU

1-10 2-10 3-10

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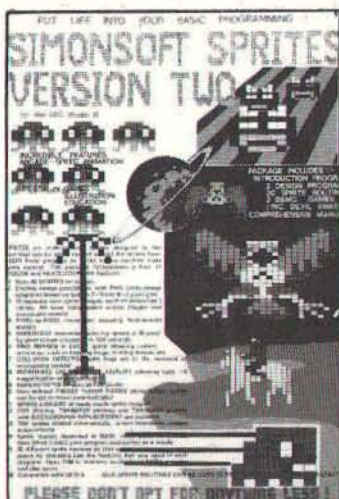


## From Page 89

multi-coloured character. But following an hour at the wheel, this no longer seemed of any significance. The beauty of this game lies in the realism of the action.

Jon Revis

## One for the 'swarm' fans



**SIMONSOFT Sprites Version Two** came on a disc with 30 entries in the catalogue. This was certainly going to take some time to review! First step was to read the manual, 32 unnumbered pages.

It is immediately apparent that the author hasn't given too much consideration to disc users, as to use any program involves using the downloader provided and a table of PAGE values in the manual. Very messy.

However the two demonstration games included convinced me that if writing "swarm" type games is your bent then this one is for you.

Back to the package proper. The disc (or cassette) contains two sprite definition programs, 20 different sprite control programs (machine code for speed), two demonstration

games and some ready defined sprites assembled in "books" that the user can play around with.

The 20 programs give users access to almost any sprite effect they may want, and are packaged separately so that only the code needed for a specific effect is in the computer.

I was quite impressed by a number of features:

- The enlargement facility gives up to  $\times 5$  magnification of a sprite. Both base sprites and their clones can be constrained to move along preset paths.
- Transfer plotting plus background storage. The background beneath a sprite is replaced after a sprite moves on. This means some loss of speed but sprites do not change colour when moving over background.

This is quite a nice package with a number of very good facilities for anyone wanting to write programs using lots of motion in Mode 2.

However the manual and/or the loading of the programs could be made a lot clearer for disc users.

Alan Plume

## From je to elles

**TENSE French** by Sulis Software is an educational package for testing the user on 20 common French verbs, using any of eight grammatical tenses.

The first tape tests present, perfect, imperfect and future, while the second tests past perfect – better known as pluperfect – past historic, conditional and present subjunctive.

The program ran easily from cassette with good instructions. The Mode 5 display menu was clear, each option producing an instantaneous, well laid out display.

The options are: 1, Change of tense; 2, List of verbs; 3, Test on meanings; 4, Test on one verb; 5, Test on all/some verbs; 6, Change volume; 7, Leave the program.

For the test on meanings, there is the full list of 20 verbs on the left, while on the right of the screen in double height letters is: "What is the French for XX?"

The program offers the choice

## 'Pit' your wits against man-eating tomatoes

IMAGINE the scene – your keyboard slowly cooling down from white heat, your joystick wilting from the tension and your monitor reeling from the bombardment of electrons.

Suddenly you find yourself in a mine, and there's obviously no-one else down there.

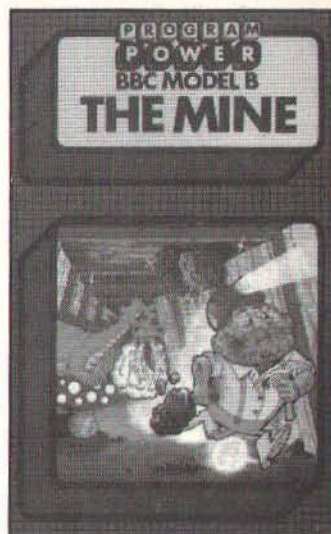
You are given your objective – the quest for buried treasure. It is easy enough to get at, so where's the challenge?

Well, I've neglected to tell you about the ferocious tomatoes and the pot-bellied dragon, probably due to all the lighter fluid or equivalent required to breathe fire!

In **The Mine**, you have a side view of the shaft, and you control a particularly 'hunky' character who wanders around it, looking for buried treasure.

The program pits (no pun intended!) its wits against you in the form of giant man-eating tomatoes that rush after you.

The real enemies though are



the squat, pot-bellied aardvark look-alikes known as the fire breathing dragons. They run up to you and spew death all over you.

Your only defence against these menaces is the 'neutraliser' which, when activated near the menaces, starts to shrink them until they finally disappear.

However, a more dramatic way of killing is to cause the rocks to fall, smashing down on any menaces in hot pursuit.

This is the best version of the arcade game "Mr. Do" that I've seen, although the market isn't exactly flooded with them.

The quality of the animation and the detail of the graphics is quite superb, especially the mushrooms and the Aardvark clones.

The program includes a hall of fame for the top scores and offers the user a choice of using the keyboard or the joystick to control the character.

The cassette is, as is usual from this company, beautifully packaged with very comprehensive loading instructions including details for disc and Econet users.

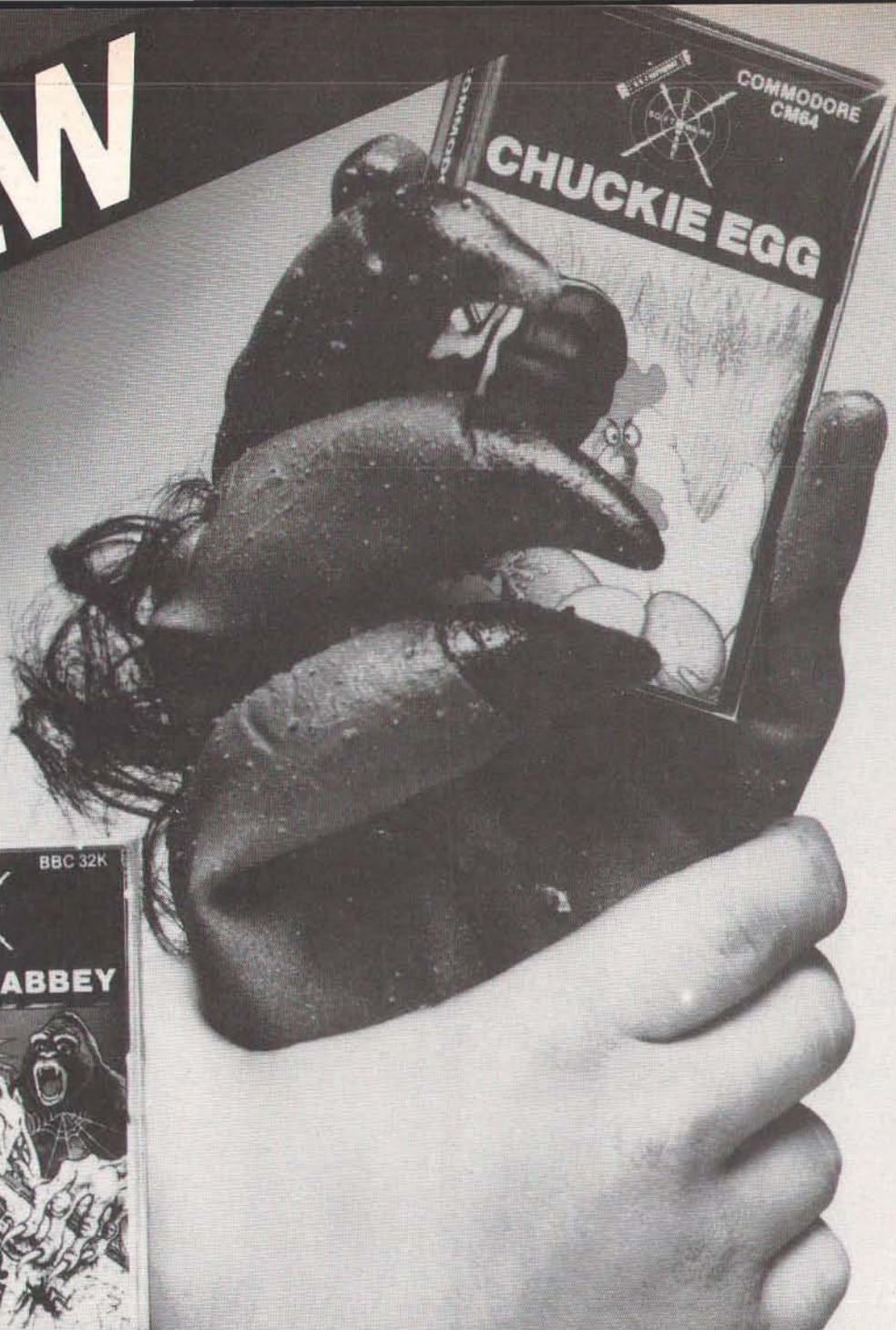
The program is recorded twice on one side of the tape. I had no problems loading it.

All things considered, this is a program for small-time games dabbblers and arcade addicts alike with many fascinating gimmicks and features.

Philip Tudor



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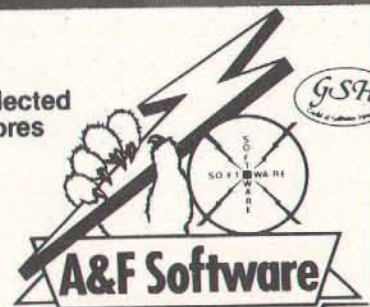


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# Peril in the 3D Vortex

VORTEX is a Mode 4 three dimensional space game, in which your spacecraft is pulled with increasing speed into a vortex, dodging marauding aliens as you go.

You have the obligatory laser, but the enemy's return fire depletes your protective shields quickly – and they don't often miss!

If you can survive this section, you then weave your way through an asteroid storm with no help from your laser. Should you get through unscathed you face yet more and faster invaders and asteroids.

Death results from a collision or being shot with no shields left, but you do have five ships. Your score depends on how long you survive and how many aliens you shoot.

The 3D effect takes time to get used to, as does the way your ship arcs up the screen as you move left and right. The fire button is auto-repeat so saving



keyboard wear – a thoughtful feature.

The game is original, with clear, fast graphics – especially the moving background – complemented by exciting sounds. It is well presented and professionally written and is as good as, if not better than, previous Software Invasion releases.

The on-screen instructions are very clear and concise. The game supports joysticks in addition to keyboard control and there is a sound on/off option.

My only criticism is that all the stages are similar in screen format – they just get faster – and this tends to monotony.

Overall though, nice one. Software Invasion.

Andrew Smith

# Only manual lets database down

BETA-BASE is a database program specifically for use with a disc system. Apart from the manual the package is well-designed and could prove very useful.

Many such programs rely on having entire datafiles in main memory when the program is running, restricting the maximum size of files.

This program, from Clares, makes use of the fast access capabilities of disc storage so that files can be held on disc with only a few records at a time in the computer's memory.

This enormously increases the quantity of data that can be handled and the only overall restriction is disc capacity. With about 10 fields per record and about 20 characters per field you could hold about 500 records on a 40 track disc.

The drawback of course, comes in the time taken up by accessing discs.

While it is possible to operate Beta-Base using only one drive, it does involve quite a few swaps between the program and data discs. A dual drive system would be much more convenient.

The system offers searches on up to five fields and sorts on up to three. The searches can be

performed if wanted by looking for a search string within a field.

This facility is useful where you are uncertain how a piece of data may have been recorded or what it consists of.

The user can enter, view, amend and delete data. Calculations may also be performed on the fields to update them or to report their total.

The data – either all records or those specified by the result of a search – can be printed out in a specified order. The user can choose which fields are to be printed and there is flexibility of layout of the fields on the page.

The redefine option allows the user to add a new field or extend the length of an existing one.

Unfortunately the program is accompanied by an inadequate manual.

Referring, for example, to the transfer-option the manual says it is very powerful, giving the opportunity to transfer the whole or part of a file and to merge it with another file so that new databases can be constructed.

Exciting stuff, but this function was so badly explained that, despite several attempts, I couldn't get it to work.

Ken Garrett

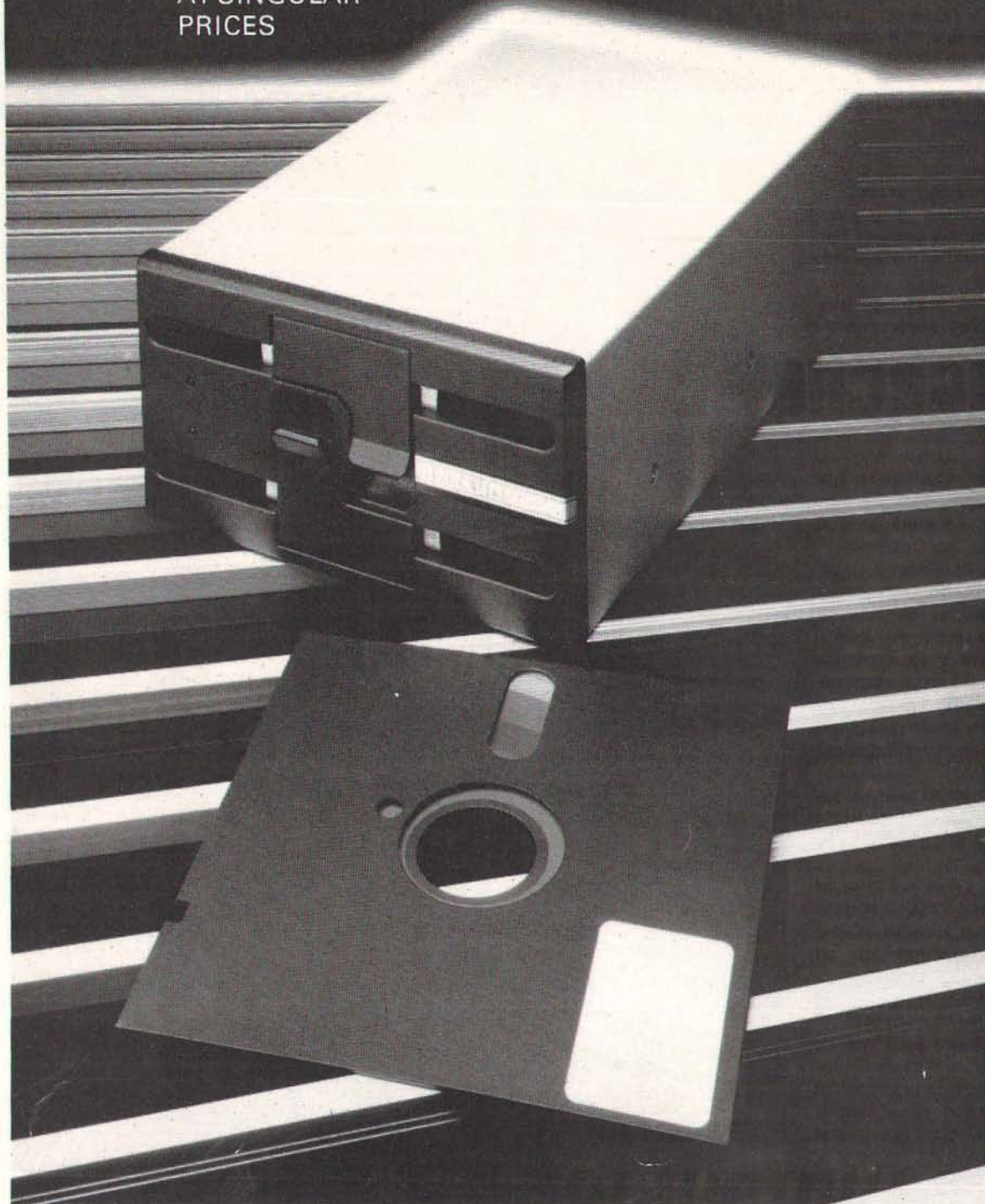
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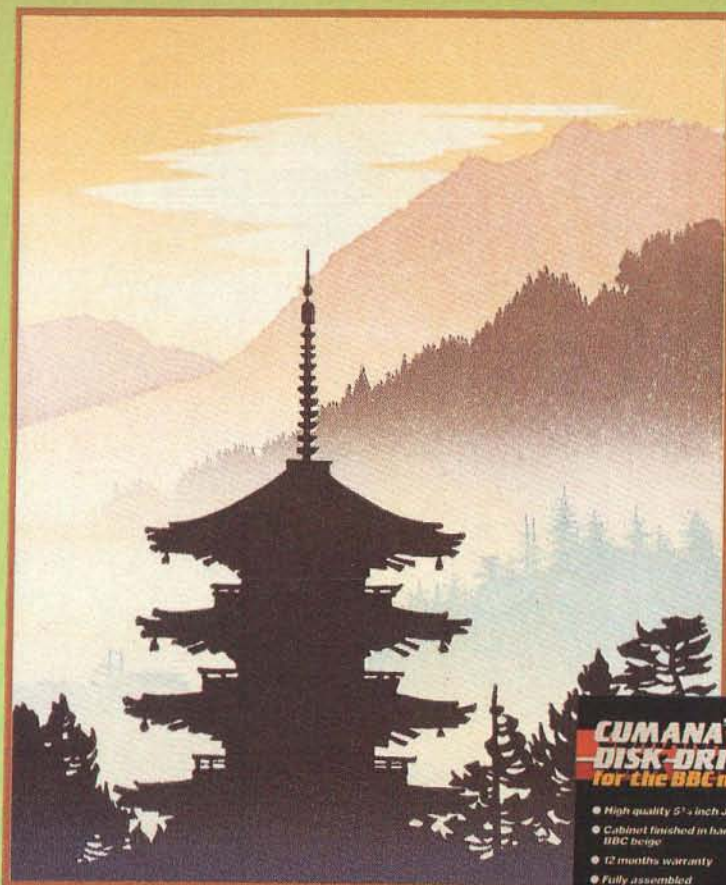
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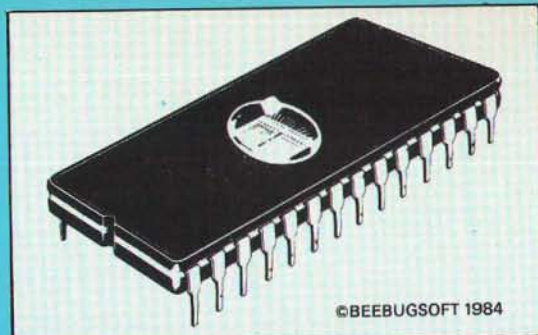
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*CHECK	Verify a program or data in memory with disc/cassette.
*CLEAR	Clear all variables including integers.
*EDIT	Enter full screen editor.
*FREE	Display free memory and pseudo variables.
*HELP INFO	Display a screenful of useful system information.
*MEMORY	Display memory contents.
*MERGE	Merge a program in memory with one on disc/cassette.
*MOVE	Move program to run at specified address.
*NEW	As NEW, but can be issued from within a program.
*OFF	Cancel enhanced error handling.
*OLD	As OLD, but can be issued from within a program.
*ON	Auto error handling—enters editor at line in error.
*PACK	Efficient program compactor.
*RECOVER	Intelligently recover bad programs.
*RENUMBER	Allow partial renumbering.
*REPORT	Extended error reporting facility.
*SCREEN	Screen dump to cassette or disc.
*UTIL	Display utilities menu.
*UTIL 1	String search.
*UTIL 2	String search and replace.
*UTIL 3	Move Basic program lines.
*UTIL 4	List procedures and functions.
*UTIL 5	List values of A% to Z%.
*UTIL 6	List numeric variables.
*UTIL 7	List string variables.
*UTIL 8	List names of arrays.
*UTIL 9	Set up range for utilities 1 and 2.

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**MASTERFILE** is a general purpose data base, written especially for the BBC Micro. It is extremely useful, allowing vast amounts of information to be quickly stored.

Once set up, the information may be retrieved or sorted at any time, in a number of different ways, using any of the fields as keys.

Records may be instantly displayed or printed, using any printer suitable for the BBC Micro, also a label printing facility is included.

Separate versions of the program are available for cassette and disc based systems. The disc version uses random access files to maximise record storage.

One extra feature of the disc version is that it provides limited spreadsheet facilities.

## Spellcheck

**SPELLCHECK** is menu driven, and is the ideal companion for **WORDWISE** or **VIEW**. It provides an automatic spelling check for letters or documents.

It is supplied with a dictionary disc already containing 6000 words, which may be increased to a maximum of about 17,000 words on a 100k disc.

Random access files ensure very fast word retrieval from the dictionary disc.

**SPELLCHECK** is menu driven, and is very simple to use, allowing unknown words to be added to the dictionary, ignored or re-spelt.

Incorrectly spelt words may be instantly respelt and a correct version of the document filed away, ready for printing or later use.

Dictionary discs for foreign languages may easily be created to help check letters sent abroad.



".... I found the program to be invaluable.... fast and reliable .... a worthwhile investment."

PCN FEBRUARY 1984



### TECHNICAL INFORMATION

The cassette version will allow up to 10 fields to be specified per record. Any number of files may be set up, and each file may hold about 110 records (based on a typical 5 field record).

The disc version allows up to 17 fields per record, and the only limitation as to the number of records, is the capacity of the disc. Typically, using 5 fields, about 2000 records may be stored on a 100k disc.

".... Works well and offers an efficient data base...."

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# VILLAINS

By DEREK BENT



THE object of the game is to prevent your four giant Lithium energy crystals from being stolen by villains intent on your destruction. You will also have to defend yourself against repeated attacks from assassins and Hugo, the mad professor. Your only weapon is a laser blaster.

The villains home-in on the energy crystals from any of the four corners of the screen. If they see one they run towards another corner of the screen where they dematerialise. Your aim – to stop them.

If you are hit by either an assassin or a villain your energy level decreases by one unit. You are slowed down if you are hit by Hugo's freeze ray.

It gets worse! You are destroyed if your energy level reads zero or if all of your energy crystals have been stolen.

Score 80 points for stopping a villain and 150 points for stopping an assassin and Hugo.

You get a bonus each time you clear a wave, and every three waves completed your energy and speed of movement are restored.

Listing starts  
on Page 161

## VARIABLES

gold%	Flag for each of the crystals that indicates whether a particular crystal has been stolen.
xpos%	X coordinates of the left and right corners of the screen from which the villains appear.
ypos%	Y coordinates of the top and bottom corners of the screen from which the villains appear.
X%	X coordinate of the player's man.
Y%	Y coordinate of the player's man.
goldpos%( ,1)	X coordinate of each of the crystals on the screen.
goldpos%( ,2)	Y coordinate of each of the crystals on the screen.
x%	X coordinate of the villains, the assassins and Hugo.
y%	Y coordinate of the villains, the assassins and Hugo.

men%  
print%

score%  
hugo%

C%

killed%

waves%  
dist%

Number of units of energy remaining.

Determines which of the crystals is printed any one loop of the program.

Player's present score.

Used inside PROC Hugo. Number of loops procedure does before Hugo attacks the play man.

Used by PROC movex. Contains the va added to the man's X coordinate. A determines which user-defined characters, for player's man, are used, depending on which v the man is pointing.

Remaining number of villains, assassins Hugos to be killed before a wave is complet Number of waves completed.

Distance the assassins can venture in from sides of the screen.





IS  
1%  
01%

Names of players on the high score table.  
Scores of players on the high score table.  
Major general variable used in the program.

## PROCEDURES

PROCinit

Defines characters used for the various parts of the villains, the player's man and the crystals. Also defines the sound envelopes and dimensions the various array variables.

PROCvar

Assigns initial values to the main variables used in the program.

PROCscreensetup

Draws screen and sets up a graphics window. Displays all the crystals and draws the player's man in the centre of the screen.

PROCscore

Displays present score at top of screen.

ROCKey

Takes inputs from the keyboard and assigns the appropriate move procedures.

PROCmovex

Updates X position of player's man unless at edge of screen.

PROCmovey

Updates Y position of player's man unless at edge of screen.

PROCgun

Fires laser in the direction the player's man is pointing. Checks to see if anything has been hit.

PROCvillain

Contains the loop for the movement and the actions of the villains.

PROCassassin

Contains the loop for the movement and the actions of the assassins.

PROChugo

Contains the loop for the movement and the actions of Hugo.

PROCgameover

Draws a sunburst type explosion over the player's man.

PROChitable

Displays high score table.



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# DATA

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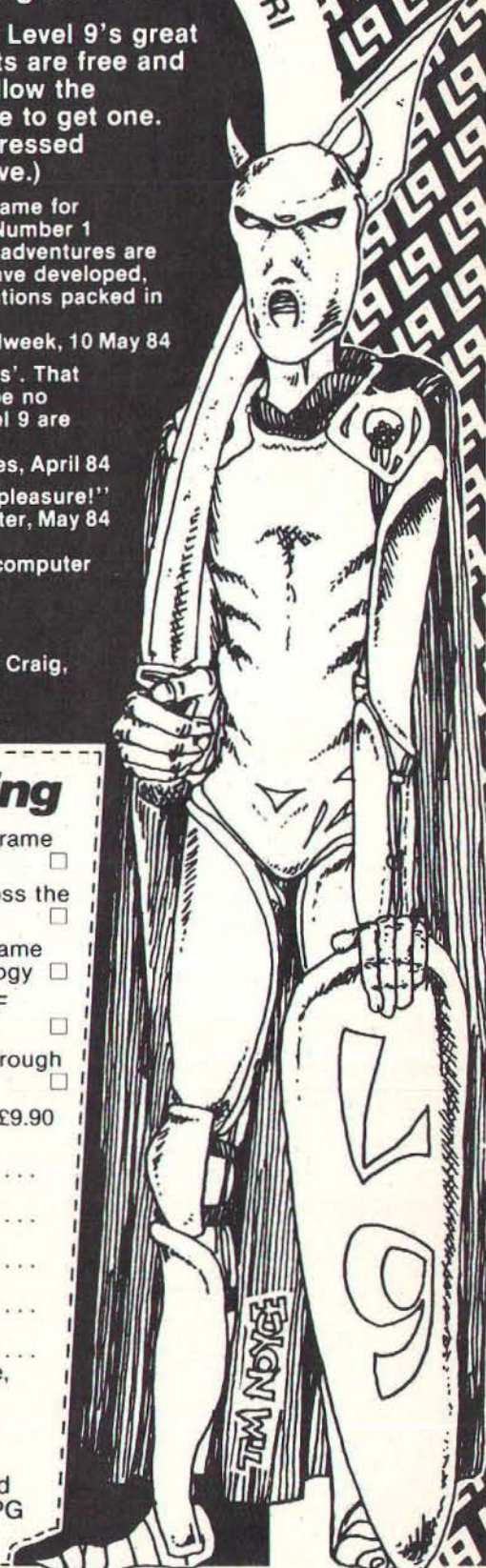
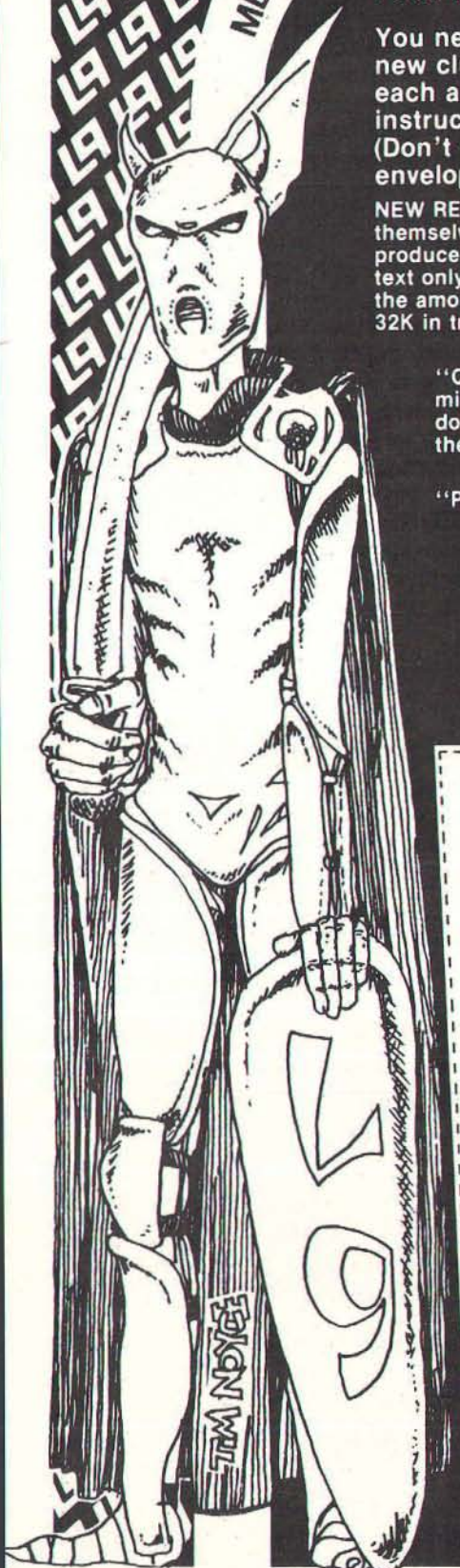
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## ALAN McLACHLAN demonstrates how to create titles for your home video

AS the video recorder becomes a standard feature in the average household, those fortunate enough to own cameras are naturally producing homemade video films.

Often they need to create suitable opening captions or closing credits to add a touch of professionalism to their final product.

Reasonable results can be obtained using the camera with suitably prepared artwork. This can range from freehand drawn and painted letters to work of a highly professional standard using commercial letter transfers such as Letraset.

This is fine in its way, but the range of letters needed for variety can prove expensive.

In the past I have achieved good results using my BBC Micro to generate screens of text which are then recorded on a video tape recorder (VTR).

It is a simple matter to remove the normal TV aerial lead from the VTR input and replace it with the lead from your BBC aerial socket. In effect you insert the VTR between your computer and the TV, as in Figure 1.

Then switch on all three machines, not forgetting to insert a suitable cassette, and select an unused channel on the VTR. Choose the channel on the TV that you normally use as the VTR monitor and tune the VTR to the signal from the BBC Micro.

You should at this point be able to obtain the BBC Micro's switch on screen. If you can't, carry out the following checks:

- Is everything switched on?
- Are all leads correctly inserted? That is, R/F out from computer to R/F in VTR, R/F out VTR to aerial socket in the TV.
- Is the VTR channel tuned correctly to the BBC signal?
- Is the TV channel correctly tuned to the VTR?

If you now run the appropriate program in the computer, all you need to do is press Play/Record or the similar switches on your VTR and any length of program can be recorded. The results can be checked by rewinding the tape and playing it.

Now let's look at the sort of programs we can use to achieve the best results. Mode 7 is simple to use and very good title screens can be produced using a

combination of single and double height characters as in Program 1.

Lines 100-130 define a procedure

```
10 REM ***PROGRAM I***
20 CLS
30 VDU23;8202;0;0;0;
40 A=GET
50 PROCdb1text("St.
Peters",12,6,129,131)
60 PROCdb1text("S C H O O L   S P
O R T S   D A Y ",1,12,131,131)
70 A=GET
80 PROCsngltext("Friday 29th June
1984",7,20,135)
90 REPEATUNTIL0
100 DEFPROCdb1text(msg$,XZ,
YZ,CZ,DZ)
110 PRINTTAB(XZ,YZ)CHR$141;
CHR$CZ;msg$
120 PRINTTAB(XZ,YZ+1)CHR$141;
CHR$DZ;msg$
130 ENDPROC
140 DEFPROCsngltext(msg$,VZ,WZ,CZ)
150 PRINTTAB(VZ,WZ)CHR$CZ; msg$
160 ENDPROC
```

Program 1

which creates a line of double height characters. It takes the following parameters:

msg\$ Text content  
X% X coordinate of the text  
Y% Y coordinate of the text  
C% Text top line colour  
D% Text lower line colour  
different

Lines 140-160 define a procedure which creates a line of single height characters. It passes similar parameters to the previous procedure. You can modify the program by inserting your own text strings in lines from 50 to 90.

For anyone with the inclination and funds, time and trouble can be saved by using a commercially produced Teletext on-screen editor.

I have achieved superb results using Datext by Optima Software. The contents of the screen can be pushed around until you achieve the required result and the screen can then be saved

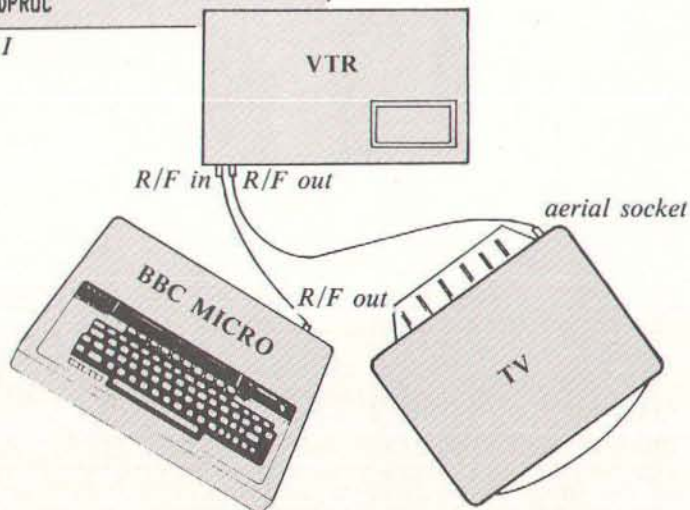


Figure 1: Connecting up the three machines





*Datex by Optima Software*

as a program and recalled under key control.

The screen editor in the August 1984 issue of *The Micro User* is also suitable for this purpose.

Programs which use the BBC's graphics facilities can be written in other modes. Program II demonstrates the use of Mode 5 by creating large characters out of square blocks.

Lines 220-240 define the block character. This is used in PROCbbc to create the large text. In PROCband it is used again alternately with an undefined character to produce the black and white check.

Lines 30-110 place the characters on

*The BBC, in common with other systems, has both RF (normal TV), and video outputs. The results from the video output are of a much better quality, but its uses are somewhat restricted and the benefits will only be noticed with the use of a monitor.*

*Regrettably, without modification the BBC video output is black and white. However the modifications are quite simple and depend on the issue of board in your micro. In order to achieve colour output a link must be made at S39.*

*On boards from issue 7 onwards this is done by sliding a shorting connector over the two pins at this location. On earlier boards the*

*modification is a little more complicated and fiddly.*

*The modification was explained in detail in an answer section of the August 1983 issue of The Micro User Micromail (Colour Clue, Page 107).*

*All you need to do is to connect a 56 picofarad capacitor between R123 and Q9.*

*Solder one end to the resistor and put a piece of insulation sleeving over the other before attaching it to the emitter of the transistor. The results of both operations should be identical – colour video output.*

*If you do not feel competent to carry out this modification yourself, your dealer will be able to do it.*

screen using two separate text graphic windows.

Program III demonstrates a simple use of Mode 5 text but printed on the graphic screen using MOVE and VDU5. This enables better centring of odd numbered characters on a screen with an even number of TAB positions.

When the REM statements at lines 50 and 60 are removed a vertical line is drawn down the centre of the screen – an invaluable aid when centring text. It can be removed later.

Program IV uses the BBC's superb string handling facilities to produce animation. Line 90 and 100 define the two lines of text to be used.

Lines 110-190 pick out each individual letter of A\$ and place it on the screen in a different colour. Lines 220-300 do the same with B\$. Lines 340-440 take the complete strings A\$ and B\$ and move them toward the centre of the screen. Lines 490-579

```

10 REM ***PROGRAM II***
20 MODE5
30 COLOUR134:CLS
40 GCOL0,0
50 VDU23;8202;0;0;0;0;
60 PROCchars
70 VDU5:MOVE250,734
80 PROCbbc
90 VDU5:MOVE280,762
100 GCOL0,1
110 PROCbbc
120 VDU24,0;146;1279;300;
130 GCOL0,135:CLG
140 VDU5:MOVE0,300
150 GCOL0,0
160 PROCband
170 VDU24,0;800;1279;954;
180 CLG
190 VDU5:MOVE0,954
200 PROCband
210 REPEATUNTIL0
220 DEF PROCchars
230 VDU23,224,255,255,255,
255,255,255,255,255
240 ENDPROC
250 DEF PROCbbc
260 VDU224,224,224,224,8,8,
8,8,10,224,9,9,224,8,8,
8,8,10,224,224,224,224,
270 VDU224,224,224,224,8,8,
8,8,10,224,9,9,224,8,8,
8,8,10,224,224,224,224,
280 VDU224,224,224,224,8,8,
8,8,10,224,8,10,224,8,
10,224,8,10,224,224,224,
224,8,8,8,8,10
290 ENDPROC
300 DEF PROCband
310 VDU224,255,224,255,224,
255,224,255,224,255,224,
255,224,255,224,255,224,255,224,255
320 VDU255,224,255,224,255,
224,255,224,255,224,255,
224,255,224,255,224,255,224,255,224
330 VDU224,255,224,255,224,
255,224,255,224,255,224,
255,224,255,224,255,224,255,224,255
340 VDU255,224,255,224,255,
224,255,224,255,224,255,
224,255,224,255,224,255,224,255,224
350 VDU224,255,224,255,224,
255,224,255,224,255,224,
255,224,255,224,255,224,255,224,255
360 ENDPROC

```

*Program II*

```

5 REM***PROGRAM III***
10 MODE5
20 COLOUR135:CLS
30 VDU23;8202;0;0;0;
40 VDU19,2,4,0,0,0
50 REM GCOL0,0
60 REM MOVE640,0:DRAW640,1024
70 PROCtext("THE",552,700,0)
80 PROCtext("MICRO USER",332,600,0)
90 PROCtext("p r e s e n t
s",190,400,2)
100 REPEATUNTIL0
110 DEFPROCtext(msg$,X%,Y%,C%)
120 VDU5
130 COLOUR3
140 GCOL0,C%
150 MOVEX%,Y%
160 PRINTmsg$
170 VDU4
180 ENDPROC

```

*Program III*



## From Page 103

repeat the procedure but in a vertical direction.

You can adapt these programs to your own use by changing the string contents in Programs I, III, and IV, or by altering the shape of the big letters in Program III.

If you have access to sophisticated editing equipment — or just a second VTR — it wouldn't matter in which order you recorded your items.

Selected sections of film, captions or otherwise, can be edited sequentially on a new tape with surprising ease by connecting one VTR directly to another, using one as a source on Play and the other as a target on Record.

Naturally there will be some deterioration in the rerecorded material but this will not be excessive.

I have been fortunate in the past to have use of a Panasonic home video console which not only allowed picture editing at the touch of a button, but permitted sound mixing as well.

Without sophisticated facilities you must record your items in the order that they will be required in the finished product:

- Record opening title from BBC.
- Record film on camera
- Record final credits/The End.

As you can well imagine, this calls for a lot more preparatory work in order to save time and trouble later. But it is worth spending that little bit longer with



a pencil and paper deciding the correct order and length of your items.

Although I have only described simple ways of producing captions, there is still plenty of room for experiment. I have achieved excellent results using these methods — and it really can be quite good fun and

extremely rewarding.

You could even create animation by clever manipulation of the Record/Pause buttons and several screens of characters and text.

I haven't tried this and would advise you to attempt the simpler techniques first.

```

10 REM***PROGRAM IV***
20 MODE5
30 COLOUR131
40 VDU23;8202;0;0;0;
50 VDU19,2,4,0,0,0
60 CLS
65 A=GET
70 XZ=12
80 CX=0
90 A$="ANIMATED "
100 B$="CAPTIONS"
110 FOR AZ= 1 TO LEN(A$)
120 COLOURCX
130 AA$=MID$(A$,AZ,1)
140 PRINTTAB(XZ,12),AA$
150 XZ=XZ+1
160 FOR DX=1 TO 1000:NEXT
170 CX=CX+1
180 IF CX>2 CX=0
190 NEXT

200 A=GET
210 SZ=0
220 FOR AX= 1 TO LEN(B$)
230 COLOURCX
240 BB$=MID$(B$,AX,1)
250 PRINTTAB(SZ,16),BB$
260 SZ=SZ+1
270 FOR DX=1 TO 1000:NEXT
280 CX=CX+1
290 IF CX>2 CX=0
300 NEXT
310 A=GET
320 XZ=12
330 REPEAT
340 PRINTTAB(XZ,12),A$
350 FORDX=1 TO 1000:NEXT
360 XZ=XZ-1
370 UNTILXZ=5
380 SZ=0
390 REPEAT

400 PRINTTAB(SZ,16),B$
410 PRINTTAB(SZ-1,16)," "
420 SZ=SZ+1
430 FOR DX=1 TO 1000:NEXT
440 UNTILSZ>6
450 A=GET
460 YZ=14
470 ZY=18
480 REPEAT
490 COLOUR0
500 PRINTTAB(6,YZ-4),A$
510 PRINTTAB(6,ZY),B$
520 PRINTTAB(6,YZ-3),STRING$(8," ")
530 PRINTTAB(6,ZY-1),STRING$(8," ")
540 YZ=YZ-1
550 ZY=ZY+1
560 FORDX=1 TO 1000:NEXT
570 UNTILYZ<8
580 VDU19,0,8,0,0,0
590 REPEATUNTIL0

```

## Program IV



# ***Log-on***

**Plug into the  
exciting world  
of telecomputing!**







# The binary beacons are lit..

DATA communication, in one form or another, has been around as long as man has.

The earliest forms of long distance communications worked on a binary system. The beacons built to warn of the Spanish Armada were capable of transmitting a single binary bit – invasion on, lit.

The American Indians with their smoke signals added a little variety by transmitting a series of different shapes of smoke columns.

Even the jungle drums of Africa used rhythms to convey messages.

All these systems were a little limited because the patterns transmitted conveyed whole messages. The breakthrough came when the letters of an individual language were broken down and given their own unique code.

Perhaps the first to do this was the navy with its semaphore flags. In this system two flags can be held in one of six positions, thus giving enough combinations for the whole alphabet.

The advent of electrical means of sending data vastly increased the distance over which it could be sent. This however called for new methods of serialising data.

I am sure you have all seen the Westerns where the town is connected

**By MIKE COOK**

to the outside world by a single telegraph wire. It was always cut just before the bank was robbed.

In the early telegraph systems this single wire could carry current or no current – another binary system.

Each letter was therefore broken down into a series of long and short duration current pulses known as dots and dashes.

This was known as morse code – not that Samuel Morse invented it, just that he had the money to back it.

The electric telegraph and the morse code it used were in fact invented by an eccentric Englishman, Sir William Fothergill Cook (*to the best of my knowledge no relation*).

As the demand for communications grew, it became apparent that morse code was not the most efficient method as it took a trained operator to use it. What was needed was a system for untrained people.

Many patents and ingenious devices attempted to decode morse code mechanically. But it was not until decades later with the advent of



computers that this could be fully realised.

The snag was that morse was designed to be learned by a person, not by a machine – different letters contained differing numbers of elements and lasted for differing times.

To overcome this people decided to invent a machine-based system. This was done by an American called Baudot.

His system consisted of five piano type keys, three for the right hand and two for the left. When the keys were depressed an ingenious system of cogs, clutches and cams scanned the keys and keyed the line.

At the remote end an even more ingenious mechanical spaghetti man-ouvred a cylindrical printing head so that the correct letter was typed on paper.

This system still took a trained operator at the sending end, as the keys to press for any letter had to be learned. But it did represent a vast improvement.

It so affected Americans that they still call five bit data codes "Baudot code" even though that has not been used since the 1914-18 war.

An English engineer called Murray took the next big step by inventing an asynchronous form of data transmission which is very similar to that used in modern computers.

It was designed to be used with punched tape, the code being arranged so that the most frequently used letters had the fewest holes, thus improving the strength of the tape.

It was also possible to rub out a character by making all the paper tape positions into holes. In this way errors could be corrected before transmission.

The transmission mechanism consisted of a three row keyboard and a paper tape reader. The keys were in the conventional Qwerty sequence with the numbers shifted above the Qwerty keys on the top row.

The transmission line could be in two states. Today we call them logic levels zero or one, but the early telegraphers referred to the states of the line as mark and space.

Mark was the natural state of the line and a space the driven state.

Each character starts by the line being driven to the space state for one unit of time. This is known as a start bit as it signifies the start of each character. The data is then sent in the next five time slices.

The line is placed in the mark state and the next start bit can begin when it has been in this state for at least one and a half time slices. This is shown in

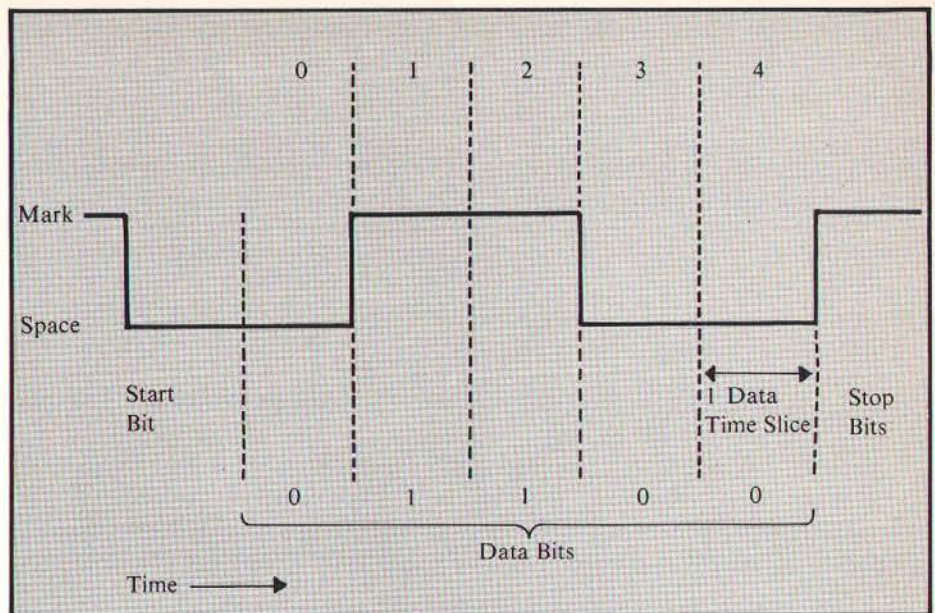


Figure 1: Asynchronous five bit data.

Figure 1.

The format of the data is said to be one start bit, five data bits and one and a half stop bits.

The time of each data element had to be long enough for cogs and clutches to engage, and so these early machines were limited in speed. They usually ran at 50 baud.

A baud is one data time slice per second, with seven and a half bits making up a character. This works out at about six and a half characters per second, a little slower than a competent typist.

As there were five data bits, only 32 different code patterns could be generated. This is not enough for all the letters of the alphabet together with the numbers and punctuation, so the concept of control codes was introduced.

On receipt of a letter shift code all subsequent codes were treated as letters. To print numbers and punctuation a figure shift code had first to be sent.

This code was known after its inventor as Murray code, although the Americans still called it Baudot code. A very similar code is still in use today on the Telex network.

Only a few characters have been changed since Murray's original code. People sometimes wrongly call it Murray code and the Americans still insist it is Baudot, although officially it is ITU Telegraph Alphabet No 2.

Many early computers used five-unit codes and modified teleprinters to communicate with the users. Names like Elliot 803 auto code still bring wistful smiles and nostalgic sighs to programmers with over 20 years in the business.

Most of the earlier computer manufacturers agreed to adopt a standard method of coding their data. The exception was IBM which decided to go it alone with its own codes.

Being big enough to do this, IBM forced the user to buy from them. Everybody else decided to adopt Ascii (American Standard Code for Information Interchange). Ghostly isn't it, but it improves if you say it with a mid-south cotton picking accent.

Ascii – pronounced Askey, as in Arthur – is a 7 bit data code employing a start bit and one or two stop bits.

There are codes for all the letters and numbers as well as punctuation and other symbols. There are also codes to control the action of a mechanical terminal.

As most terminals are now visual display units a lot of the original definitions do not make sense, so various manufacturers have interpreted them to have various effects such as flashing characters.

This produces incompatibilities in what is supposed to be a compatible system. If you look at the VDU commands on the BBC Micro you will see how these control codes have been interpreted by Acorn. They exploit the unique features of the BBC Micro.

With the advent of micros and their 8 bit data buses, serial data with 8 bits became more popular, as it is convenient to transmit a byte in one word. Also parity has been included.

Parity is an extra bit set in such a way that the total number of mark states



## From Page 107

transmitted — including the parity bit — is an odd number.

This is known as odd parity. To complicate matters, you can use even parity.

At the receive end the parity is recalculated and if it does not agree with the received parity there must have been an error.

If the parity is correct then it is assumed there is no error although you can have two errors cancelling each other out. Therefore the inclusion of a parity bit makes some combinations of bits or codes not valid, or as we say redundant.

Thus in any serial system both transmit and receive both have to be set to the same word format — number of data bits, number of stop bits and odd, even or no parity.

The other aspect of serial data transmission which needed standardising was the physical state of the transmission lines for mark and space.

Early machines used a current loop system. A 20mA was the common standard. This had 20mA flowing round the circuit in one direction for a mark and in the reverse direction for space.

The current was used to drive a relay which operated the electro-mechanical clutches.

As this is a constant current system the driving voltage has to increase sufficiently to get the required amount of current flowing.

On a short line this is not very much, but on a long line or under open circuit conditions it could rise to about 180 volts, enough to give you a nasty shock.

With the advent of non-mechanical terminals this current was not needed, so a voltage standard arose. This is the RS 232, which not only specifies the voltage levels for mark and space but also specifies what plug to use and what signals are on what pins.

A space is represented by any voltage between 3 and 15 volts, but most people use 12 volts. A mark condition is represented by a negative voltage of the same size.

The RS423 system used by the BBC Micro is an improvement on the RS232 while still being compatible under most circumstances.

The RS423 has a space being represented by any voltage between 0.2 and 6 volts and a mark being the same in the negative direction.

It is an improvement as the impedance of the lines is lower, allowing signals to be less prone to interference and to travel further.

The standard specifies how far a signal path should be. As this depends on the type of cable, this is also specified.

The technical specification for the cable is a little technical, but it boils down to not being too thin or closely spaced.

The cable should be 24 AWG (American Wire Gauge) or larger. It should have a DC resistance of not greater than 98ohm/km and the capacitance between one wire and all others within the cable should not exceed 131 pF/m.

Using a cable of this sort with a data rate below 1,000 baud the system should be capable of being used over 1,000 yards.

As the data rate goes up this distance drops, so that at 10,000 baud it is down to 100 yards. Remember, this is with a standard cable.

As well as the signal path, this standard also specifies other protocol or handshaking signals. These are mainly designed to be used by a modem for telephone conversations.

The BBC Micro provides only two — an RTS (request to send) and a CTS (clear to send).

Just to confuse matters these are the reverse logic sense of the data. This means that when the signal line is active — that is, making a request to send data — it has a positive voltage on it.

The names of the signals are self explanatory. RTS says: "I want to send some data", whereas CTS is saying: "You are clear to send me some data". So RTS is an output and CTS is an input.

Confusion arises because you must always connect an input to an output. However the RTS line must always be connected to the same pin on the socket according to the standard. Therefore on some equipment RTS is an input receiving the request from the transmitter.

In order to know which way round to connect things you have to know whether your equipment is considered to be Data Terminal Equipment (DTE, where RTS is an output) or Data Communications Equipment (DCE, where RTS is an input).

When there were only mainframe computers to worry about it was all very simple. The computer and the terminal were DTE and the two modems

connecting them were DCE.

However with the advent of micros people wanted to connect the computer directly to the terminal, and so some makers configured their computers as DCE.

This allowed a normal lead to be used. However if a computer is configured as DTE then a special cable has to be used with crossover connections. For example, pin 4 on one plug would connect pin 5 on the other.

This confusion also applies to the two data lines labelled Transmitted Data (output on DTE) and Received Data (input on DTE).

It is hardly surprising then that sometimes the only way to find out is to experiment.

Some of this confusion is avoided on the BBC Micro by the "special feature" of not having a standard plug. This plug is capable of being inserted in two ways in the socket.

It would have been nice if this would swap over the appropriate signals, but for some reason it was not wired up that way.

The really useful aspect of having a standard (of sorts) interface built into your computer is that you can communicate with other machines of the same or different sort.

I have transferred programs from my TRS-80 into the BBC machine via this route. As the Basic is very similar, programs would run provided there were no graphic commands (in effect trivial programs).

Also the screen width is different, and so screen formatting is wrong. However it has been of significant use when transferring data files between machines.

When information in the form of the written word is required computer compatibility does not matter.

It is possible to "talk" to computers all over the world. You can extract information from them or leave messages on them.

The methods of communications are very much more efficient and sophisticated now than they have ever been. However that is not to say we have anything useful to say to each other.

As an example of this, just after the 1984 budget I logged onto the Prestel computer only to be informed there was a new message for me. It was from a wine merchant offering wine at "pre-Budget prices".

Well wine came down in the Budget, so he was either very stupid or very clever. Think about it!



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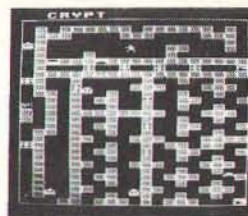
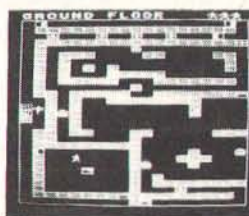
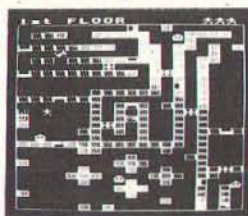
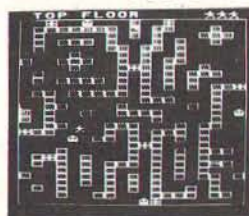
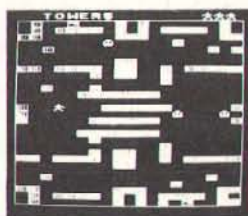
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- FRED THE FROG needs co-ordinated help to get across the pond.

### EARLY YEARS 2

- THE POND seems very active today
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**MORE and more BBC Micro owners are accessing Prestel, British Telecom's vast database. It's not surprising, for with its Mode 7 screen, the BBC machine is ideal for receiving Prestel via an appropriate 1200/75 baud modem. Here, STEVE GOLD takes a look at how Prestel has developed, and what it's got to offer the BBC Micro.**

MOST teletext systems are a trade-off between speed of access and number of pages. The number of pages broadcast via British teletext – Ceefax and Oracle – is around 600, with about 10 per cent of Ceefax pages allocated to tele-software.

Prestel, or viewdata as it is generally called, started life in the research laboratories of the then Post Office at Martlesham Heath in Suffolk.

In the late '60s and early '70s the department was examining the possibilities of developing viewphone, a service which would enable two people to see as well as talk to each other.

This scheme was eventually shelved as uneconomic, but the seed of viewdata was sown.

In 1974 the Post Office developed a viewdata system and showed it to TV manufacturers. The response was favourable and in 1975 the first steps were taken in producing viewdata televisions.

The Post Office viewdata pilot trial opened in 1976 for research purposes and two years later was extended to 1,500 subscribers in London, Birmingham and Norwich under the name of Prestel.

It soon became obvious that the £400 premium on the price of a Prestel TV set was too high for the residential user. This, coupled with high access charges, severely restricted market penetration.

The system limped along with 10,000 to 15,000 users until the light dawned on firms that here was a tailor-made business medium.

So Prestel Citiservice and Skytrack were born and business take-up blossomed. The emphasis was now on business users, and the poor old home users were neglected. Until, that is, someone hit upon the idea of converting micros to work with Prestel.

Prestel continued to blossom and in 1982, Birmingham-based Viewfax brought out a database – a group of pages – aimed at micro users and that means mainly BBC users.

Viewfax offered them a mixture of news and views, together with a number of telesoftware programs. Several were free, but the better ones were chargeable

by frame charges added to the Prestel bill each quarter.

Viewfax's main problem was the quandry most information providers find themselves in. If they charge for their frames, the number of frame accesses – the number of times viewers key in to the pages – is low. If they make the pages free, many people access the frames but there is no income for the information providers.

In practice Viewfax has developed into an interesting database with several hundred pages to look at. However, as in most businesses it cannot afford to put out too many pages or the £5 a page a year rental it pays to Prestel will cause financial headaches.

So with information providers one

apart from a local telephone call most residential users need pay little more than the £5 a quarter Prestel subscription if they stick to cheap rate, off peak times.

Micronet subscriptions are an extra £8 a quarter, resulting in a combined quarterly bill for Prestel and Micronet of £13 – just £1 a week.

For this the average micro user gets 100 free programs (if one excludes the telephone charges) and 40,000 pages of news, views and telesoftware. Plus, of course, access to the full Prestel database – some 250,000 pages.

The opportunity offered to software producers to place chargeable telesoftware on the Micronet database has not been missed. Big sellers are

---

## ***For just £1 a week you can get an awful lot out of Prestel and Micronet 800***

---

tends to find a chicken and egg syndrome. More pages are needed to generate more income, but those pages cost – so slow growth is the norm.

Viewfax, however, continues to provide a steady stream of information to BBC Micro users.

Late in 1982 East Midlands Allied Press, publishers of several regional newspapers, hit upon the idea of charging Prestel users a subscription rather than lots of small frame charges of pennies and ha'pennies.

In 1983 they launched a new service – Micronet 800 – aimed squarely at micro users. Cost? The basic subscription to Prestel is £5 a quarter, and the access charge is 5p a minute is used between 8am and 6pm Monday to Friday, or between 8am and 1pm on Saturday. Outside these hours there is no access charge. So it can be seen that

available for downloading at around 80 per cent of their retail price, which, when taken in with the convenience factor – no trip to the micro shops – is very good value.

The availability of telesoftware is, in fact, its greatest attraction. A program which may not warrant the full retail price of, say £8 could be available on Micronet or Viewfax for £2. With no distribution costs, the break even point to the author is very low.

The nearest analogy to Micronet 800 is that of an electronic computer magazine – constantly changing with up to the minute news and information.

It is possible to get by with just the basic Prestel subscription of £5 a quarter, but most BBC users will find the extra £8 a quarter well worth it.

● *Next month I shall look at the availability of other databases.*



# Microweb... the most exciting thing to happen to the Beeb for yonks

OVER the past few months thousands of *Micro User* readers have logged on to Microweb and discovered for themselves why it's the most exciting thing to happen to BBC Micros for a long time.

However, trying to convey this excitement to someone who's never logged on is always difficult.

It's rather like trying to explain an adventure game to someone who's never played it... as the actress said to the bishop.

What I'm trying to do in this article is explain the adventure of Microweb to you. Not that I'll be giving you all the answers - what good is that sort of adventure?

No, I'll be attempting to give you

enough insight into Microweb to make your own journey from then on. Where you go, and what you find, will be entirely up to you...

First of all, let's get the mundane essentials out of the way with a talk about equipment. You must use a 300 baud full duplex modem with 8 bit no parity - this, I'm afraid, means that Prestel/Micronet only modems are of no use.

And of course, you'll need some suitable software - we've published the sort of thing you'll need several times. However, here at *The Micro User*, we make no secret of the fact that we think Commstar is the best for this purpose.

Let's assume that you've dialled our

number (061-456 4157) and have your modem set to 300 baud full duplex, with you set to receive.

Your modem, while of course attached to your micro and the phone line, should not as yet have "modem connect" set.

Wait until Microweb has answered your call and you can hear the high pitched whine of the carrier before you connect.

If you have Commstar running, all you need do then is to go into chat mode with "C". If it's your own home-brewed software, remember not to echo characters, add line feeds (if only at first) and make sure you're on 300/300 baud.

You should be greeted with the:

WELCOME  
TO  
MICROWEB

message, followed by a bit of "advertising".

At this point, should you be met by garbage, don't give up. Try the next stage to solidify communications.

Microweb will ask you your first name, expecting your answer to be followed by a Return.

It will then quiz you for your second name and, finally, where you come from.



*Microweb will ask you for your first name*



### MICROWEB Top Level Menu

```
<R>ead . . . . . Microweb messages
<Q>uick-scan . . . . . Microweb messages
<L>eave . . . . . Microweb messages
<M>mail . . . . . Electronic mail section
<T>ime . . . . . Elapsed time
<P>roblem . . . . . Page
<G>oodbye . . . . . Terminate session
<D>ownload . . . . . Programs
<F>ormat . . . . . Reconfigure terminal
<X>pert . . . . . Change user level
<C>hat . . . . . Talk to Sysop
<N>ews . . . . . Latest happenings
```

### *Microweb's Top Level Menu*

Even if you're unsure as to what's coming back to you, try to type this in correctly as it will become your unique ID.

The board will then echo it back to you for confirmation. If you answer no, you will be asked to repeat the process.

It's at this point that the board magically becomes clear for users who've previously had a lot of distortion – so persevere!

Next you'll be asked your terminal width – most of us would pick 40 – and then you'll be asked to enter the letter of your terminal.

As it stands at the moment it's rather a "choose one from one" situation – there's only one terminal to pick, the BBC Micro. This assumes that your micro can support both upper and lower case and needs no line feeds – that is, your software provides them.

However you can change this by either pressing Return when asked to pick the letter of your terminal, or by asking to modify your choice when you have made it.

In either case, you'll be asked again the width of your terminal, whether it supports upper and lower case, and if line feeds are needed. If everything appears on just one line, you need line feeds!

You'll also be asked if any nulls are needed in after each <cr> (Return). Your answer should always be 0. Nulls were padding/timing characters needed in the old, slow teletype days in order for the terminal to catch up with itself.

If you're asked for the clear screen

code, it should be just 12 for the BBC Micro – other parameters asked for should be 0.

All this sounds incredibly longwinded

### **By MIKE BIBBY**

for something that, in practice, takes just a few seconds.

You'll then be informed what the last message on your last call was, what the current last message is and the time you're allowed on – a strictly rationed 12 minutes.

You'll then see the Microweb Top Level Menu – a set of single key instructions that will allow you to roam at will through Microweb. (See the screen above.) Before looking at the menu in detail, let's consider the general idea of Microweb.

This is simply an electronic bulletin board – ring in and leave your message for others who ring in to see. They reply to yours, or add their own subjects and so on.

And this, basically, is all Microweb is.

However, very soon, as with any bulletin board system, certain obvious categories of messages begin to occur that properly deserve their own board.

What we've done in Microweb is to provide the boards we feel necessary.

If you feel like letting off steam on a particular subject, or passing on a message to all and sundry, why not leave it on Microweb itself by choosing the <L> option from the menu?

You'll then be prompted carefully

through the easily-learned procedure for leaving messages.

If however, you've got a programming query, don't leave it here. Choose <P> from the main menu and put it on Problem Page. That's where our problem-hungry experts look as soon as they log on.

If you fancy a look at the latest news and gossip, with unexpurgated Barry Woods and messages smuggled over the wire from Andrea, pick <N> from the main menu.

You might, of course, be using us as a dead letter drop to send messages privately to a particular person. In this case, choose <M> for electronic mail (E-Mail). Only people who log on as the intended recipient will see the message.

Incidentally, one of the commonest misuses of the board is people using the essentially private E-mail to send messages to ALL.

This will only send the message to the rather unlikely person who logs on as ALL.

If you wish your message to be read by all, including ALL, leave it on Microweb proper with <L> from the main menu.

Well, as you can see from the Top Level menu, we're only on the surface of the possibilities of Microweb. For example, we've totally ignored the software you can download.

In the next edition of *Log On*, I'll tell you more, but for the moment, why not log on and find out for yourself? After all, it's not an adventure if I tell you everything . . .



# MICROWEB

## NEWS...

**From: Basildon Itec**

**To: All**

Basildon Itec has just joined the 300 baud mob. We are thinking of setting up our own BB for our trainees to run. Any advice welcome. We have VIEWDATA host running on 0268 - 22177 unless the line being used by this system. More modems soon. Thanks.

**From: Bjarne Listlund**

**To: All**

To all users on this databank. I hope we can make a user group for microbee owners we don't see one here in Denmark. I hope there are some users on this micro. Users there will please help me.

You can contact me on phone number 05 928959. If you will contact me on my modem you have to call after 1900 then I will answer you. Or you can write me on address: Bjergetgade 69 7000, Fredericia DK-7000, Fredericia.

**From: Mike Bibby**

**To: All**

We're still very very interested in getting submissions of games and educational programs - particularly in the educational field as that's where I hail from and I know there's an awful lot going on that's terribly parochial.

The material we've got already is very exciting. One of the things that amazes us here is that the level of software we get for the magazine tends to exceed that of commercial software produced only a few months before.

There are an awful lot of sophisticated programmers out there! We're also interested in new utilities - have you anything to contribute? Even if you aren't sure, why not send us a SAE for our programmers' and reviewers' guidelines? Mike.

## IN GENERAL...

**From: Tim Crais**

**To: All**

A joke.

Q. How can you tell that an Irishman has been at the word processor?

A. The Tippex on the screen.

**From: Paul Hollyer**

**To: Sysop**

Many thanks for allowing a member to wander at will, as the Board is so easy to use. Only query is - What is the difference between "<L>ine and <B>lock entry" mode? Also, why do my sentences get split up with "(1916)"?

**From: Paul Hollyer**

**To: All**

Mr and Mrs Hollyer are pleased to announce their new acquisition. Delivered as at 10.45am on Sunday July 15, in Chesterfield. Only five days beyond advised delivery time (Sir Clive please note). An example of interfacing at its best. A micro weighing in at 8lb 4oz.

Originally designated the Model 2. Now universally addressed as "Robert James". Needs some further development, with complete programming, but hopefully will grow to a "main-frame".

P.S.: Many thanks to all at the Scarsdale Hospital, Chesterfield!

**From: Mike Bibby**  
**To: Paul Hollyer**

Line and block with prompts are much the same, you just type them in as normal. Ignore breaks, they don't show up on the message. It's just a simple way to write the software and the only way they could do it in the size of program they've got available - otherwise they'd be writing a full RS232 word processor. The numbers refer to the numbers of bytes left your allowed for this message. The real advantage of block is that you can then transmit a whole file - say from disc - in one fell swoop - or block - and the board would accept it. Hope that's clear. Mike.



## PROBLEM PAGE...

**From: Paul Hollyer**

**To: All**

I've just got the second processor and I find that some of the ROM based \*commands I have either don't work or operate in a restricted manner. An example are the commands with the Graphics Extension ROM. These work with the system integer A% normally, but with the second processor they fail, operating properly with numbers. HELP!!!

**From: Richard Atkinson**

**To: Doug Weller**

Hi Doug. On reading one of your letters about downloading with Commstar I followed it but when I tried to load it from disc "Bad Program" was the answer I received. Can you give me any HELP!

**From: Des Riglar**

**To: Paul Hollyer**

When running Basic the system variables (A%,B% etc) are stored from location &404 onwards. Each variable takes up 4 bytes of memory. When running in the main processor the sideways ROMs can access this memory, but when running in the second processor the ROMs can't unless they are programmed to do so. All is not lost though, as when the operating system processes a star command (\*ROTATE, \*PLOT, \*SCALE etc) the whole command line is piped to the main processor. Solution: Convert all commands to be performed into strings and use OSCLI. Example: Page 40 of User Manual, line 50 in main processor \*POS J%,I%,90. To use in the second processor ... OSCLI"POS"+STR\$(J%)+","+STR\$(I%)+",90"  
Don't forget to put the spaces between the arguments. If you want to use the \*GFX command then to get A% as seen in the main processor you will have to use OSWORD 5 to read from &404 and the next 3 bytes. This applies to B% & E% as well.

**From : Doug Weller**  
**To: Richard Atkinson**

Most programs downloaded from BBs are in Ascii form (except for a couple on Computer Answers). This means that you have to \*EXEC them first and then SAVE them as Basic programs. So you've got them OK just \*EXEC them and SAVE again.

**From: Mark Austen**

**To: All**

Can anyone tell me the pin-out of the RS232 port on the Interface 1 for the Spectrum?

**From: Dick Menhinick**  
**To: Mark Austen**

Hi - The ZX Interface 1 has the following pinouts: 1, No connection; 2, data input; 3, data output; 4, DTR (active handshake input); 5, CTS (active handshake output); 6, no connection; 7, ground; 8, no connection; 9 +9V (pull up). The connector on the interface is a DB9S (female) as you will need a DB9P to connect to it. Happy soldering.

**THESE are typical messages that have appeared recently on Microweb - The Micro User's own bulletin board. All you need to log-on to us is a modem and suitable software. The Pace combination is ideal and, as you can see from the offer on Page 170, superb value for money.**

**As well as the bulletin board, there are news pages, programs to be downloaded and electronic mail. Log-on soon, and you'll see why they're saying Microweb's a must for every BBC Micro User.**

**The number to dial:  
061-456 4157  
The service is open  
24 hours a day.**



## ANDY HOOD offers a short program to enable you to join the bulletin board set

IN my article in the July edition of *Log-on*, we looked at the easy way in which flows of data in the BBC could be directed at any or all of the three main output devices — screen, printer and RS423 port.

We also covered the equally easy manner in which data could be received from combinations of the keyboard, filing system and RS423.

In following through the concept of streaming data to and from different devices, and — in our application — creating a program to store data received at the RS423, we touched upon the concept of “buffering” data in memory until it was convenient to interrupt the program and process it by saving it onto tape or disc.

In doing this we mimicked, in a simple way, one of the most powerful features of modern micros.

You may have noticed when typing at the keyboard that even when the micro appears to be busy listing a program it still finds time to acknowledge your key press and, when it has finished its main task, display and act upon your input.

To do this, the micro must obviously be regularly interrupting the action of listing the program, checking to see if any keys have been pressed and if so, putting them into a temporary store or buffer.

This kind of almost invisible background task is occurring all the time and for obvious reasons is known as an interrupt routine. Frightening isn't it, what's going on behind your back!

The Beeb has one of the most comprehensive sets of interrupt routines of any modern micro and the majority of its input and output is buffered, in a similar way to the keyboard example, by these secretive routines.

The automatic storage and release of data collected in these various internal buffers means that short bursts of data can be sent or received at quite phenomenal speeds.

These can then be processed at a much slower rate, provided that the buffer is emptied before the next batch of data is received.

You may by this time be wondering why I am going into such detail about a routine that is carried out entirely automatically by the operating system and which on the face of it needn't concern us. The answer of course is that it does.

I mentioned last time we would be looking at the protocols or “etiquette”

# A micro terminal for the asking..

used in communications to ensure that both the sender and receiver of data are, as you might say, in “sync” with each other.

The most common of these protocols is the use by a receiving terminal of decimal codes 17 and 19 to tell a sending terminal when to stop and start data transmission. These are known by the mnemonics XON (17) and XOFF (19).

Simply put, they work something like this:

When a sending terminal receives the XOFF signal during the transmission of data, it should immediately cease sending characters until it receives the XON signal to instruct it to resume transmission.

Simple, you say, and so did I the first time I tried it. But this is where those interrupt routines beavering away in the background can cause problems.

You will probably be familiar with the term *baud* used as a measure of the speed of data transfer — 300 baud being roughly equivalent to 30 characters per second.

Imagine then our super fast machine code program — yes there's more to come — executing on average half a million instructions per second, placing characters in the RS423 output buffer which is only being emptied at the rate of 30 characters per second.

You can readily see that the program is going to spend nearly all its time waiting for the RS423 buffer to be emptied, and that at any point when we

receive an instruction to stop placing characters in the buffer the interrupt routine will still have a full buffer to empty, which of course it will carry on doing after we have stopped.

Should this happen, we will still be sending characters to the remote terminal after the XOFF signal has told us that it is not ready to receive them.

Perhaps the obvious answer is to stop those interrupt routines from operating and indeed the 6502 processor does have a specific flag to either disable or enable them under user control.

This is known as the “I” flag and responds to the assembler instructions CLI — CLear Interrupt enable (that is, disable them) and SEI — SEt Interrupt enable.

However, using this method has two major drawbacks. More importantly the interrupt enable flag is not to be lightly tampered with on such a heavily interrupt driven machine as the Beeb (dabble at your peril!).

In addition, we would lose all the advantage of automatic data collection that the interrupt routines provide for us. Fortunately, and not surprisingly, the MOS again provides us with a routine to solve our problem in a more satisfactory way.

Much as the FX or OSBYTE call 145 that we looked at in the last article extracted characters from buffers and returned with a flag set to indicate whether it was successful or not, OSBYTE call 152 will check the appropriate input or output buffer and



# Interrupts, beaver- ing away in the background, can cause problems...

return with a flag set to indicate whether the buffer is empty or not.

The important difference is that it does not extract any data from the buffer, but merely checks its current status. If the buffer contains characters then the carry flag will be clear on exit and if empty it will be set.

We may then place a character into the output stream and repeatedly scan the buffer until the OSBYTE routine indicates that it is empty, ensuring that a queue does not form in the buffer waiting to be cleared by the interrupt routines.

In my previous article, I said that we would look at coding more of our terminal program in assembly language to increase its speed and flexibility.

The Micro Term program shown in Listing I is written entirely in machine code and as well as incorporating the XON/XOFF protocols for file transmission, it will allow you to copy incoming data to the memory buffer, save the buffer contents to, or load the buffer from, disc or tape and send the buffer contents to the RS423 port.

To assemble the program, first type

PAGE=&3000 and then load the source code listing. Run the program and when the assembly is complete enter:

\*SAVE MTERM 1A00 1D00 1A00

The program may then be run from disc or tape by entering \*MTERM.

The following function keys are used to control the program's actions:

- f0 Copy incoming data to the buffer. This is a "toggle" switch and will alternately switch the buffer on and off with appropriate status displays.
- f1 Output the buffer to the RS423 port. This will send the entire buffer contents using XON/XOFF protocols.
- f2 Save the buffer to disc or tape. Pressing this key will clear the screen and prompt you to enter a valid filename. The entire contents of the buffer are then transferred to

a file which, if a Basic program, may be re-entered into the computer using the \*EXEC file-spec command.

- f3 Load a file into the buffer for transmission using the f1 option. A filename prompt is given in a similar manner to the save option.

This short program will enable you to communicate with many bulletin boards, and of course with *The Micro User's* own Microweb system, and will allow you to both upload - send - and download - receive - both messages and programs.

The program is an example of how easy the BBC Micro with its powerful operating system can make machine code programming.

In the next article, we will look at how those curious assembler instructions work.

Happy hacking!

## Micro Term listing

10 REM Listing	tus=&78	tl	yboard	740 BCC wait
1	180 start%=&1A00	370 STA buffpoin	530 JSR storecha	750 RTS
20 REM Micro Te	190 FOR opt%=0 TO	tl	r	760 .sendchar
rm	0 3 STEP 3	380 STA bufftopl	540 .check_keybo	770 PHA
30 REM (<e>) Andy	200 P%=start%	390 STA xon_xoff	ard	780 JSR toRS423
Hood 1984	210 [OPT opt%	_status	550 JSR keyboard	790 JSR wait
40 OSASCII=&FFE3	220 .entry	400 STA buffer_f	_scan	800 PLA
50 OSWRCH=&FFEE	230 \REM enable	lag	560 BCS mainloop	810 JSR OSWRCH
60 OSBYTE=&FFF4	RS423 input	410 LDA #&1D	570 JSR sendchar	820 RTS
70 OSFILE=&FFDD	240 LDA #2	420 STA buffstar	580 JMP mainloop	830 .increment_s
80 OSWORD=&FFF1	250 LDX #2	th	590 .getchar	tore
90 buffstartl=&	260 JSR OSBYTE	430 STA buffpoin	600 LDA #145	840 INC bufftopl
70	270 \REM set up	th	610 LDX #1	850 BNE nocarry1
100 buffstarth=&	transmit 300 ,rece	440 STA bufftoph	620 LDY #0	860 INC bufftoph
71	ive 300	450 \REM program	630 JSR OSBYTE	870 .nocarry1
110 bufftopl=&72	280 LDA #7	loop	640 BCS nochar	880 RTS
120 bufftoph=&73	290 LDX #3	460 \REM *****	650 TYA	890 .increment_p
130 buffpointl=&	300 JSR OSBYTE	470 .mainloop	660 RTS	ointer
74	310 LDA #8	480 JSR getchar	670 .nochar	900 INC buffpointl
140 buffpointh=&	320 LDX #3	490 BCS check_ke	680 RTS	910 BNE nocarry2
75	330 JSR OSBYTE	yboard	690 .wait	920 INC buffpoin
150 buffer_flag=	340 \REM set up	500 JSR display	700 LDA #152	th
&77	buffer & flags	510 LDX buffer_f	710 LDX #2	930 .nocarry2
160 operand=&76	350 LDA #0	lag	720 LDY #0	
170 xon_xoff_sta	360 STA buffstar	520 BEQ check_ke	730 JSR OSBYTE	

Turn to Page 171



**APPLICATIONS for the BBC Micro in communications mode are unlimited, but here are a few suggestions:**

- Use a BBC word processor, such as Wordwise or View, at home or in the office to prepare text, and then copy the whole lot over to a professional word processor for quality printing after some reformatting to take advantage of the expensive daisywheel's characteristics.

- Use the BBC Micro in the laboratory to collect data off apparatus, over a period of hours or days perhaps. After suitable processing with a BBC program, copy the files generated to the mainframe, where high powered programs can lick the data into shape, or store it on the mainframe's very large filing system.

- Use the mainframe to extract data from its files, in a suitable Ascii format, and move that data to the BBC Micro, where it can be displayed, manipulated, reformatted and generally digested, before sending it back to the mainframe.

This application might be appreciated in busy installations where the mainframe is heavily loaded with many different users.

- Build up lots of separate data files on many different BBC Micros before sending it all to the mainframe for storage on a database, which could then be examined by the people who provided the data.

This is a way in which a large organisation, maybe a charity or political party, can get its data computerised by voluntary help without clogging up the central office with tens of thousands of records which would overwhelm limited resources.

**Have YOU any suggestions for linking the BBC Micro to a mainframe? If you have any ideas to share with our readers – especially if they have actually been put into practice – send them in.**

**We will pay £10 for every idea published – and more for detailed descriptions.**

**The address to write to is:**

**"Mainframe",  
Europa House,  
68 Chester Road,  
Hazel Grove,  
Stockport SK7 5NY.**

# Talking to big brother

By JOHN LEACH

**ONE of the most valuable applications of the BBC Micro is to make use of its power to communicate with large computers.**

It brings to life the concept of distributed processing, where small jobs are done by the micro, but for big jobs, or to read very large files, it links in with the mainframe.

This application may not sound very exciting to the lone home enthusiast, or even a school. But you only have to walk around any university computing department, or one of the many firms with mainframes, to see the BBC Micro used in this way.

**How do you communicate with a large computer?**

The simple answer is that you connect three wires to the RS423 port and connect these to the mainframe input/output port.

That really is a bit too simple because the vital software element has been omitted.

Lots of articles have appeared during the last couple of years on communication between computers, with associated programs, but very few go far enough to make a particularly valuable contribution to the problem.

Before going on, let's define a few terms.

**Mainframe:** Any large (greater than 1 megabyte), multiuser, multitasking computer which supports interactive terminals. There is a very blurred distinction these days between a minicomputer and a mainframe, so let's

not muddy the issue by considering this argument.

For our purposes the mainframe must be capable of sending asynchronous RS232 protocol Ascii to and from its terminals, and it must use the XON/XOFF protocol, of which more later.

**Terminal emulation:** First of all, the BBC Micro must be able to emulate the terminals supported by the mainframe. Usually these will be complex devices, with cursor control, highlighted characters, graphics of various kinds and different scrolling modes.

There are many different types of terminal, and each will have its own set of control codes, usually in the form of an Escape sequence – that is Ascii 27 – followed by a mode definition byte, followed by a varying number of bytes according to the specified mode.

Anyone who has programmed graphics on an Epson or similar printer will be familiar with Escape sequences.

One of the most popular terminals for mainframes is the DEC VT100 and its offspring. The BBC Micro is quite capable of emulating nearly all the VT100 features, apart from the 132 character per line screen mode.

Another terminal family widely used in industry is the Tektronix graphics terminal, which can be used for graph plotting and picture drawing in general.

**File transfer:** While it is very nice to have the BBC Micro used as a cheap but effective spare terminal, this hardly counts as distributed processing.

The vital extra feature is the ability to



transfer files to and from the mainframe, and this is where the problems begin in trying to write suitable software.

Assuming that a disc system is attached to the BBC Micro, the software must ensure that every byte sent by either machine is copied over correctly, and at the same time the

process must be stoppable by keyboard interference.

Errors can occur during transmission. The mainframe may for some reason stop sending data for a while, the BBC may develop a disc fault – Disc Full, perhaps – or you may decide that the wrong file is being transmitted

anyway and want to halt the process.

During file transfer it is essential that the XON/XOFF protocol is properly observed by the BBC software. This protocol enables two computers to

## Don't feed the mainframe garbage

HERE are two short programs to enable your BBC Micro to communicate with a mainframe.

Remember that it is no good writing data to disc file in the normal way with programs like:

```
100 file=OPENOUT("DATAFILE")
.....
200 PRINT#file,VARI,ZZ,TEXT$
.....
300 CLOSE#file
```

The BBC stores data in a special coded form, such as with strings saved backwards on disc. To see what is going on, just \*DUMP a file written in the conventional Basic way.

If such a file is sent to a mainframe it would read garbage. The mainframe requires a pure Ascii file, with text the right way round, and each line of text terminated with a carriage return (&OD).

Fortunately the operating system contains a little known feature which can come to the aid of the hard-pressed programmer.

Ever heard of \*FX3,16? Neither had I until I read the Advanced User Guide. This nice feature turns off the spooler.

As everyone knows, a file created with \*SPOOL sends all screen/printer output to the named file, including screen prompts and so forth.

Using \*FX3,16 you can select just what output you want to go to the disc file, as the following program illustrates:

10 REM Creation of an ASCII file from a BASIC program

```
20
30 REM J.M. Leach, 1984
40
50 DIM COMMAND 40
60
70 MODE 7
```

```
80 PRINT ""
90 INPUT "Enter output file name"
> "F$
100 PROCoscli("SPOOL "+F$)
110 PROCset_spool(FALSE)
120 REM Demo program saves even numbers only on file
130
140 FOR IX=1 TO 20
150 IF IX MOD 2=0 OUTX=TRUE
:Q$="Even"
:
ELSE OUTX=FALSE
:Q$="Odd "
160 PROCset_spool(OUTX)
: REM Write if even
170 PRINT IX;" ";Q$
180 PROCset_spool(FALSE)
: REM Turn off spooler unconditionally
190 NEXT
200 PROCoscli("SPOOL ")
210 REM Demonstrate output file
220 PRINT "Press <RETURN> to see file "+F$
230 REPEAT UNTIL GET =13
240 CLS
250 PRINT ""
260 PROCoscli("TYPE "+F$)
270 END
280
290 DEF PROCoscli(text$)
300 $COMMAND=text$
310 X%=COMMAND MOD 256
320 Y%=COMMAND DIV 256
330 CALL &FFF7
340 ENDPROC
350
360 DEF PROCset_spool(logic%)
370 IF logic%=TRUE PROCoscli("FX3,0")
ELSE PROCoscli("FX3,16")
380 ENDPROC
```

The procedure PROCoscli is provided for those without Basic II. If you have this use the OSCLI command and remove line 50.

The output file could be copied straight to a mainframe and then, preferably, deleted after display.

We now know how to write an Ascii file to disc, ready for transfer to a mainframe.

What about reading the file back in again? Unfortunately BBC Basic has no facility for reading such a file from disc, as it expects the special coded form referred to previously.

However it is quite easy to write a simple routine in Basic or machine code to read such a file and build it into a string, which can be decoded with MIDS, VAL, and so on.

Here is a very short Basic version, which will read a file created by the previous program. In practice, of course, the file would have been copied over from the mainframe:

10 REM Function returning string from ASCII file

```
20
30 REM J.M. Leach, 1984
40 MODE 7
:PRINT ""
50 INPUT "Enter file name to be read" > "F$
60 PRINT
70 F=OPENUP (F$)
80 REPEAT
90 line$=FNread
:PRINT line$
100 UNTIL EOF #F
110 CLOSE #F
120 END
130
140 DEF FNread
150 LOCAL A$
160 REPEAT
170 Q%=BGET #F
180 IF Q%>=32 AND Q%<=127 A$=A$+CHR$(Q%)
190 UNTIL Q%=13
200 =A$
```



## From Page 119

communicate over three wires — data in, data out and ground.

On the BBC Micro the RS423 port also contains the RTS and CTS handshaking lines, which are used when, for example, a serial printer is connected.

If these pins were used in communicating with a mainframe five wires instead of three would be needed, and it would not be possible to make use of a modem.

Connecting the BBC Micro is easy enough, provided one vital thing is done — connect the RTS and CTS pins together inside the DIN plug inserted into the BBC Micro.

If this is not done the whole project will fail and the micro will just hang up.

XOFF means that an Ascii 19 Ctrl S character is sent, which tells the other computer to halt transmission until XON Ascii 17 Ctrl Q is received.

This is essentially a two way process, for typing Ctrl S at the BBC keyboard must make the mainframe stop sending data temporarily, until re-enabled with

Ctrl Q. Conversely the mainframe, busy with perhaps dozens of other users, must be able to tell the BBC Micro to shut up for a while.

The mainframe XON/XOFF sequences will be invisible to the user, except perhaps for occasional jerkiness in the terminal display.

However the BBC Micro file system is very slow compared with mainframe systems, which can write to files at megabytes per second. So when a block is to be written locally, the mainframe must be prevented from sending any more information, as otherwise the RS423 input buffer will fill up.

From what has been said already — and that unfortunately is not the full story — the reader may be left wondering what the point of this article is, if there are so many pitfalls to be avoided.

Well the simple answer is, go and buy a chip!

As the usefulness of terminal emulation and file transfer was recognised some time ago, lots of people have achieved the objective, and there is quite a wide choice of sideways eproms available.

Computer Concepts, for example, have produced Termi, a fairly unsophisticated program, and Communicator, which emulates the VT100, but can be tailored to suit other terminal types.

Pace have produced Commstar, which additionally gives teletext displays and will link into Micronet. Several university computing departments, such as Bristol, Bath and Sussex, have written eproms.

Workstation, from the University of Sussex, is the only one with which I have had personal experience. It behaves faultlessly when connected to a Vax computer, allowing terminal emulation both as a VT52 terminal (a less sophisticated VT100), a Tektronix graphics terminal, and a disc file to mainframe two way transfer facility.

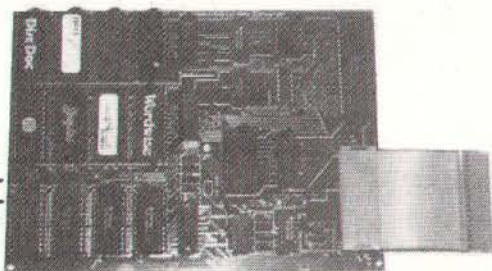
An extra goody is a screen dump to Epson printer routine, when in Tektronix mode. This works fine, if rather slowly.

In VT52 mode it supports all the DEC EDT screen editor function keys. This statement may not mean much to non-DEC users, but there are a lot of them about.



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Prestel mode features full colour Prestel graphics including double height and flashing characters. Full Telesoftware capability is offered allowing the many free programs offered by Micronet 800 to be downloaded into your computer. Pages of particular interest may be 'marked' for later retrieval and display. Page images may be copied and saved to a file on the current filing system.

### Terminal Mode

In terminal mode all input may be copied into a buffer in memory or spooled directly on to disc. Full control over buffered data is provided allowing it to be listed to screen or printer, sent to the RS423, saved to or loaded from the current filing system (including TAPE).

Commstar allows full configuration and easy control over the protocols used. Send and receive baud rates, word length, parity and number of stop bits are selected from a simple table of options.

When in chat mode (80 or 40 column), characters transmitted by the host will be displayed on the BBC screen and characters typed on the BBC will be sent to the host.

Commstar allows ANY type of file (not just ASCII) to be transferred 'safely' using XMODEM protocols. In fact, four individual methods of transmission are provided for within Commstar giving great flexibility.

Using a disk based 'emulation file' Commstar can be configured to emulate virtually any terminal type including VT100, within the capabilities of the BBC.

In addition to the above, most MOS commands can be executed from within Commstar, errors are trapped by Commstar's own error handling routines and an optional elapsed time clock may be displayed. Data filter, Local Echo, Auto-line feed, printer on/off and XON/XOFF protocols may be toggled in or out by a single key press, extensive use being made of the function keys.

Finally, Commstar may be fitted into any of the sideways ROM sockets and is provided with a comprehensive manual.

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This package contains the Toolstar firmware in Eprom and a very comprehensive manual (over 150 pages), containing many examples and illustrations to help you make the best use of Toolstar's exciting capabilities.

### Toolstar sheds new light on your BBC micro

Toolstar, being Eprom-based will be permanently resident in your computer allowing all of its commands to be immediately available. It is 'transparent' to both the user and the operating system; once a command has been executed, control is returned to Basic, or whichever ROM had control prior to the command.

### Powerful building blocks for Basic programmers?

Within Toolstar there are 22 commands, 8 of which operate between PAGE and TOP i.e. on the current Basic program or Basic programming environment. These commands obey standard Basic command syntax rules.

### Reveal the deepest secrets of your discs

Toolstar allows the operations of Formatting, Verifying, reading or writing a disc sector to be carried out very simply from Basic i.e. all the necessary building blocks required to develop a comprehensive set of disc utilities, simply and effectively.

### Lost your memory? - No more amnesia with Toolstar!

In addition to the commands described above there are 9 commands which operate on the whole of the BBC's memory and are designed to complement the BBC's built-in assembler. These include a full feature disassembler and memory dump, each with forward and reverse scrolling.

### If this is not enough Toolstar can be Extended!

There are three help menus on Toolstar which may be obtained by typing HELP TOOLS, \*HELP MCODE or \*HELP EXTEND. The third option menu will initially display the following:

\*HELP EXTEND

EXTEND <RAM add>

i.e. typing 'EXTEND <address>' will allow the user to extend the facilities of Toolstar with routines which are supplied by himself. The manual describes fully how this operation is carried out and illustrates it with several examples.

In the future such utilities will be made available on disc and cassette from Pace, thus allowing a comprehensive library of utility programs to be built-up.

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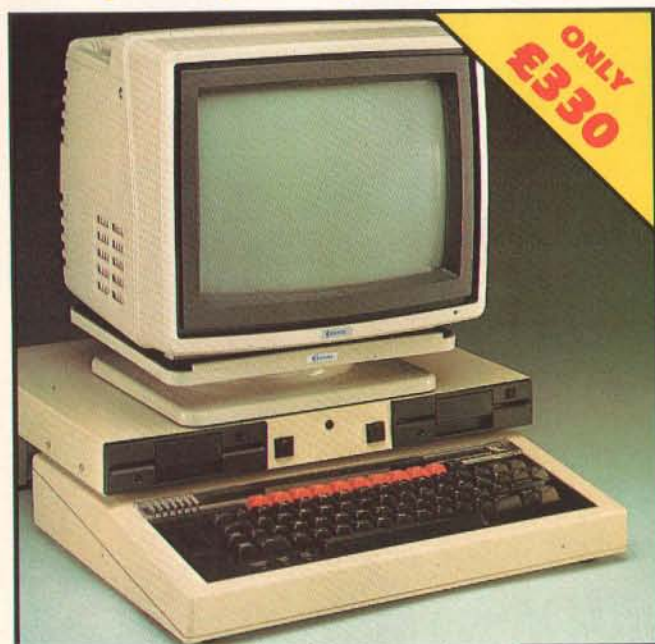


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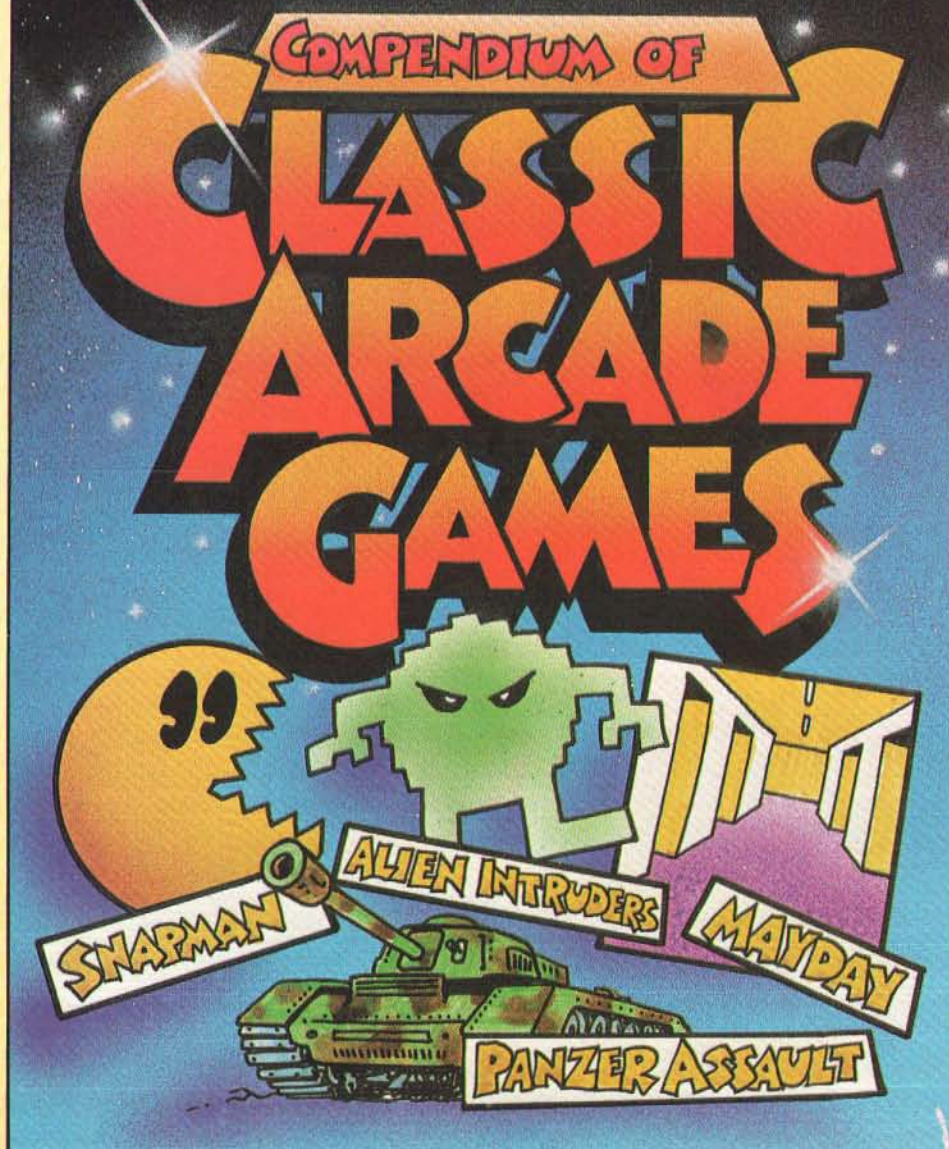
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*Interbeeb DCP-Microdevelopments*

IT is true to say that no matter how many inputs and outputs you provide on a computer somebody will always want more. Fortunately there seems no shortage of those willing to provide them.

One neat idea comes from DCP Microdevelopments and is called Interbeeb. It is a black box which plugs into the 1MHz bus and allows a wide variety of input/output types.

The box measuring 3in x 4½in is covered on all sides with a variety of sockets allowing all sorts of devices to be connected into your micro.

To begin with there is an 8 bit digital input port and a ditto output port. Both are mapped to the same address on the 1MHz bus so that to output a byte you simply write to the address (using `&FCC2=A%`). To see what is on the inputs simply read the address, using `A%=?&FCC2`.

Note that the eight bits on the user port can be either inputs or outputs, but with this device you have eight of each.

Next are four switched inputs. These are very similar to the eight digital inputs except they are pulled down internally and so need switching to 5 volts to register their value.

Moving along the side of the box there are four relay outputs. They make a small clicking noise as they pull in. All the relay contacts are rated at 12 volts at 1 amp.

A single contact is brought out on the box for each relay and a single common connection, thus the loads switched by the relay must have a common connection.

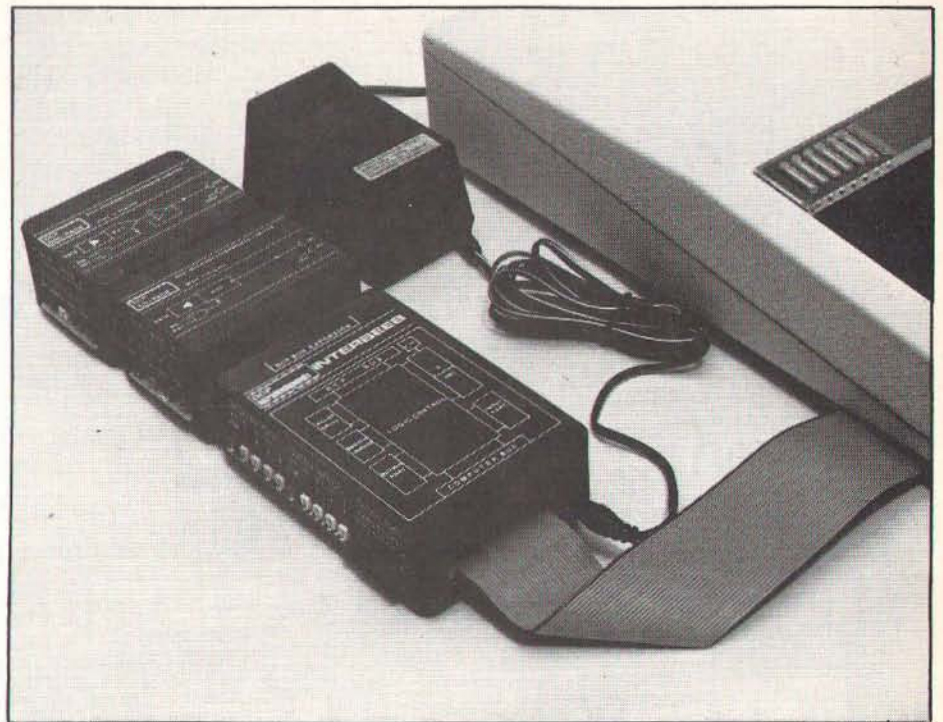
They cannot be independent, although you could easily unscrew the lid and wire the relay contacts separately.

Along the other side of the box are eight analogue inputs. These are connected to a single 8 bit analogue-to-digital converter. You first need to select a channel to convert and then you can read the results.

As conversion time is about 0.1 milliseconds you can read the result in the next line of Basic. As it is 8 bits it will return a value between 0 and 255 for voltages from 0 to 2.45 volts (+/- 5%).

If you are really cunning you could scan each channel as part of the interrupt service routine just like the analogue input on the BBC Micro.

Finally, along the top side is the DCP



## Get more out of (and into) your micro with a little black box

bus socket. This allows extra modules to be connected end-to-end in domino fashion. Two of these extra modules were also loaned for this review – a fast analogue/digital converter and a digital/analogue converter.

The A/D converter, unlike the one in the main box, has a single input, but like the other one also has 8 bits resolution. However it is much faster and can perform the conversion in about 10 microseconds – 10 times faster than the main box.

However like the box there is no way of telling when the conversion process has finished. This is no problem with a Basic program but in machine code you will just have to experiment to find exactly how long you have to hang about before the result is ready.

The D/A converter will produce an

analogue signal in approximately 10 millivolt steps. This means that if you store 100 at its address location you will get a 1 volt output.

A nice touch is that all the modules have labels on the top with a diagram of the function of the module enabling you to better appreciate what is going on inside.

All the modules are powered from a separate calculator type mains adaptor capable of producing 500mA. The Interbeeb is at a fixed address on the 1MHz bus (`&FCC0` to `&FCC4`) and so only one may be connected to the machine at any one time.

The plugs and sockets needed to make the connections to the boxes are not provided, but are standard and



## From Page 125

should not be difficult to get hold of.

The documentation, described as provisional, was a little sketchy but contained all the relevant facts and a few simple Basic examples of how to access each device.

If you are looking for a simple way to connect more into your Beeb then the Interbeeb might be just what you are looking for.

Mike Cook

# Suntan for chips?

Uvipac eprom eraser *Ground Control*

PERHAPS the current interest in eprom programmers is because many people are developing ROM-based software. If you are one of them, before long you are sure to need an eprom eraser – unless, that is, you never make any mistakes.

The trouble is that most erasers seem to cost more than you would wish, for after all they are just an ultraviolet lamp. Or, as I would have it, an ultra violent lamp.

However most commercial products do have built-in timers to control the degree of suntan you give your chips, as well as safety devices to prevent any harmful rays assailing your eye balls. This quite naturally increases the cost and puts them out of reach for hobby applications.

Now Ground Control has come up with a stripped down version at a stripped down price – a small black box just over 3in square.

On one side is a small flap that can be raised to accommodate three eproms. The unit then plugs in the mains and 20 minutes later your eproms have more than a touch of instant amnesia.

The unit did work but the conducting foam carrier keeping the eproms in place had the habit of getting jammed inside. Also there was no indication of whether the unit was actually on apart from it getting hot.

If you are going to use it occasionally then it is perfectly adequate for the job. But if you want to erase any number of eproms on a regular basis then you will just have to cough up the extra money.

Mike Cook

WHAT exactly are machine code monitors, and how can they help us program? Here JIM NOTMAN assesses two of the latest ROM based monitors.

# Monitor

AFTER getting to know Basic many will want to learn how to write 6502 machine code using the assembler built into Basic. This may be just to write fast or specialised routines to add to Basic programs, or possibly programs that are written completely in machine code.

Unfortunately once you've written the code and had it assembled it's not as easy as Basic to debug if it doesn't work as expected. Basic has the great advantage of having many informative error messages to help with debugging – messages that are not given in machine code – unless you write them yourself.

This is where a machine code monitor helps. With this software tool you should be able to run a machine code program, checking what effect the code has by going through the code one step at a time (single stepping), showing the contents of the registers and status flag. This is an especially important facility for beginners, who often have difficulty with the settings of the status flags.

Beebmon *Watford Electronics*

AFTER starting up Beebmon by typing in \*MONITOR, Mode 7 is selected and a little command strip is displayed along with a command request.

These commands fall into two types – those concerned with memory display and modification and those with program execution.

The memory display and modification commands include disassembly of code, hex and Ascii dump of memory. The cursor keys control the position of the cursor, allowing scrolling both upwards and downwards, and the place where editing takes place, simply by overtyping previous values.

Then editing the disassembly allows it to be used as a simple assembler.

Memory tasks include:

- ☐ Fill a block of memory with a specific value.
- ☐ Give the Checksum of a memory block.
- ☐ Move memory.
- ☐ Relocate memory. This alters code to act as if it were at a different address.
- ☐ Search memory for a string or series of bytes. Send a \* command for any operating system call.

Inputting the commands was easy and clear, simply by pressing one or two letters without the need to press Return. Other details, such as a start address, would then be requested. The cursor can

be moved left and right within an input field by the cursor keys so that mistakes can be corrected.

The simplest way of seeing what the monitor will do is to look at a screen of output from a short piece of code which transferred the screen memory (see Figure 1) into another area of RAM before being \*SAVED.

As you would expect on a machine code monitor the registers can be individually set before debugging.

As seen in Figure 1 up to nine columns of information are given. The seven left hand columns are what you expect a monitor to have with the current location, disassembly of code and the contents of the registers. The two right hand columns give the address of the operand and its contents – very useful with machine code which uses much in the way of indexed or indirect addressing.

The bottom row contains the values of the registers, including the separate flags that make up the status register.

Instead of single stepping, sections of code can be emulated. This is where breakpoints are needed. They can be placed in any position you want to halt the program and examine the registers.

In Beebmon these breakpoints are used in a far more flexible way than in the majority of monitors. This is because a table is referred to before each step of program execution, so that breakpoints can be set, even in ROM.

Conditions can be attached to the



# your machine code program's progress

breakpoint, for example to cause a break when the accumulator or X or Y registers has a particular value or when a location is being written to.

The single stepping and emulation can be used with any page ROM as well as RAM. Even Beebmon can be examined in this way.

Trace limits can be set, so that only code between given addresses are shown, avoiding displaying calls that are made outside the code you are interested in.

Much of the screen output can be directed to either the printer or a file on the currently selected filing system. This is necessary when debugging routines where the screen must not be disturbed.

One page of memory is reserved as workspace, normally at &0400, but this can be moved if page &4 is needed. A short 19 page spiral bound manual details all the commands and some examples of use.

Watford Electronics are honest enough to include a section on what their software cannot do, mainly emulating interrupts and storing the VDU queue, which are rather complex and specialised pursuits.

This machine code monitor is simple

to use yet powerful in operation. It should appeal both to the beginner who will want to see how machine code works and to more experienced hacks who want a good debugging facility.

## Gremlin

## Computer Concepts

ALTHOUGH this is also described as a monitor and debugging aid, it could hardly be more different from Beebmon. It's not the sort of package you can jump into without first painstakingly going through the manual.

When Gremlin is entered it stays in the currently selected screen mode. A large amount of information is printed on the screen in 40 and 80 column modes, as part of the 'status display' (Figure II).

The top row shows the contents of the accumulator, X and Y registers along with the individual flags of the status register. The second row gives the stack pointer plus the bytes that are being pointed to. Similarly the third row gives the program counter plus a number of bytes that are pointed to.

The next line will disassemble the

code at the program counter or print ??? if it is not a valid code. The remaining lines give a hex dump with Ascii equivalents of memory pointed to by a variable called \$M.

Gremlin is characterised by a number of system variables. Rather than have a command to set, for example, the X register, it will want to have the variable \$X set to the required value.

Apart from commands concerned with memory manipulation and program execution, this package has an assembler and an extensive expression evaluator.

First, a look at some of the memory manipulation commands:

The memory of the status display, pointed to by \$M, can be edited by punching in data, in bytes, words, strings or even an assembly statement.

The memory pointer can be altered by an expression like \$M=3000 or by adding or subtracting a value from the pointer with + and -.

There are other commands for searching for data, moving data, tabulating memory (in hex and Ascii)

Watford BEEBMON Electronics									
Execution mode									
Command :									
Loc	Opc	Operand	A	X	Y	P	Opad	Op	
3000	LDA	#7C	00	00	00	00			
3002	STA	A1	7C	00	00	30	00A1	53	
3004	LDA	#00	7C	00	00	30			
3006	STA	A0	00	00	00	32	00A0	FF	
3008	STA	A2	00	00	00	32	00A2	0A	
300A	LDA	#40	00	00	00	32			
300C	STA	A3	40	00	00	30	00A3	00	
300E	LDY	#00	40	00	00	30			
3010	LDA	(A0),Y	40	00	00	32	7C00	83	
3012	STA	(A2),Y	83	00	00	B0	4000	83	
3014	INY		83	00	00	B0			
3015	BNE	3010	83	00	01	30			
3018	LDA	(A0),Y	83	00	01	30	7C01	9D	
3012	STA	(A2),Y	9D	00	01	B0	4001	9D	
3014	INY		9D	00	01	B0			
Acc. X Y S PC			NU=3017C						
00 " " 00 01 FA			3000 10110000						

Figure I: Beebmon disassembly

A=20 X=00 Y=00									
S	=01FF	89	10	E3	B8	93	93	DC	89
PC	=3000	A9	7C	85	91	A9	40	85	93
LDA #7C									
2FF0	00	00	00	00	00	00	00	00	00
2FF8	00	00	00	00	00	00	00	00	00
M	=3000	A9	7C	85	91	A9	40	85	93
3008	A9	00	85	90	85	92	A0	00	00
3010	B1	90	91	92	C8	D0	F9	E6	00
3018	93	E6	91	10	F1	60	00	00	00
GREMLIN									
!\$M=3000									
!\$PC=\$M									
!\$W JE 1									
!CALL 3000									

Figure II: Gremlin status display



# HARDWARE REVIEW

## From Page 127

and disassembly.

Code can execute by single stepping, with breakpoints or by a call. As you would expect all the registers can be set individually. When setting the X register, for example, you will be aware of the difference between = and ==. The == only expects one byte as in \$X==10, only altering the X register. The = expects two bytes.

If the X register is assigned two bytes, as in \$X=3080, the X and Y registers are treated as a pair so that the least significant byte is placed in the X register and the most significant in the Y register.

Apart from RAM, paged ROMs can be single stepped. These ROMs are selected with \$ROM.

Limits can be set on the code that is to be debugged, so avoiding display of code outside those limits. Output can be sent to a printer or a file so that graphics

routines can be debugged.

Breakpoints can be set, but only in RAM, not in ROM or even in RAM in a sideways ROM socket. They do not have conditions attributed to them like Beebmon's.

Gremlin has a full assembler capable of single or two pass assembly. Short routines can easily be typed in directly, but probably it is best to use a text editor to write the assembler program. Not surprisingly Wordwise is suggested! There are some differences compared with Basic and these are documented in the manual.

As I said, the expression evaluator is very extensive, being based on the language C. There is a command PRINT to print out the results of the expressions.

The operators + - \* / for add, subtract, multiply and divide will be familiar to Basic users.

There are however a number of other symbols which will not be so familiar. Like &, which performs a bit-wise

AND, and % which performs a MOD.

Something new to Basic users will be << and >>, which do a bit shift left and bit shift right, for example PRINT value>>1 will printout value with its bit pattern shifted 1 bit to the right, which in binary arithmetic divides by 2. A more useful operator than you first think.

As well as system variables you can use your own variable names. As with Basic they may be up to 254 bytes long, with all characters both upper and lower case being significant.

This is a flexible and powerful package. A 32 page spiral bound manual gives all the commands with examples of how they may be used. Strangely, coming from a company which is best known for Wordwise, a piece of software which is simple and easy to use, this is complex and will take some time to know. But it does have a large number of facilities.

OK for the expert, but not really for the beginner in machine code programming.

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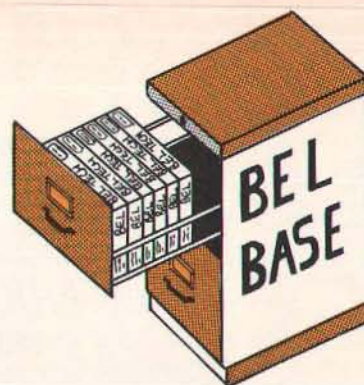
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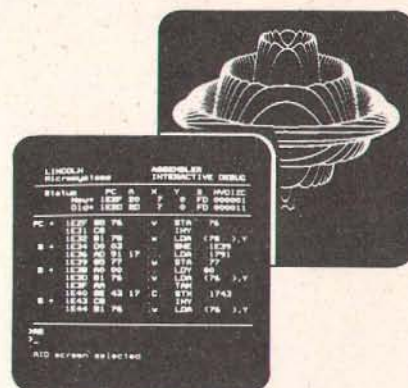
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# Rollerball

By GEOFF  
TURNER

**REMEMBER** those little plastic maze toys containing several ball bearings? By tilting the maze in various directions, it was possible to steer the balls into the central section of the maze.

Of course it's quite easy to get one or even two balls into the centre, but they soon find their way out again if you tilt in the wrong direction.

Here is a program which simulates one of these toys. It even gives you the option of choosing how many balls you wish to use.

If you find the game too easy, using the invisible maze should soon bring you down to earth!

*Complete instructions for playing the game are contained in the program listing.*

*Here's how it works:*

A short machine code program is assembled at lines 100 to 190. This is used to assist in the continuous flow of music while the game is being played.

It is necessary to check the status of the sound buffer to see if room is available to add more notes to the queue.

The machine code is called in

PROC MUSIC at line 3140.

Two procedures are used to initialise the variables. PROCINIT1 sets those variables which only require initialising at the start of the game. PROCINIT2 initialises variables which need to be reset after every game.

These procedures are called at lines 210, 220, followed by a call to PROCINSTRUCTIONS, which displays a description of the game and the playing instructions.

A large chunk of the program is taken up by the procedure to set up the screen display between lines 500 and 1440.

Basically a number of green squares are drawn on the screen starting with the maximum size, and reducing each one by 64 pixels.

The final square is drawn in yellow to show up if the option to use an invisible maze is taken.

The data in lines 1710 to 1880 is then used to develop the squares into a maze by closing off certain sections and making gaps at various points in the squares.

Also in PROCSCREEN the arrows

to indicate direction of tilt are drawn and the elapsed time clock is printed.

The main loop of the program is fairly short, simply moving the balls in the current direction of tilt.

The main loop procedure also checks to see if any keys are being pressed to request a change of direction.

Note that \*FX11,0 is used to disable the key repeat facility, so it is pointless holding down a particular key.

As the balls move around the maze it is necessary to perform a lot of checking using the POINT command to see if each ball has hit a wall or another ball.

PROCHECK is therefore called from within the main loop before the balls are moved to their next position. Having decided the direction of the balls, it is necessary to check no less than eight points around the ball.

Unfortunately all this checking does tend to slow the balls down a little, so I have compacted the main loop procedure into multi statement lines where possible to help keep the speed up.

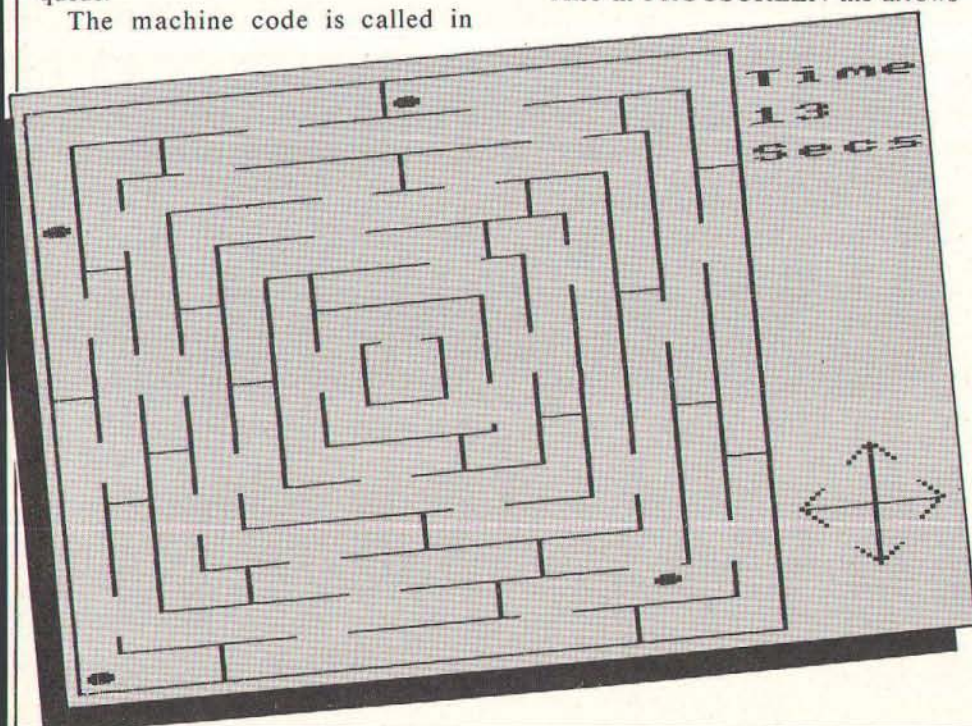
A further important check is necessary after each movement of the balls to see if they have all entered the central square. PROCWIN is used to carry out this check.

Note that if any ball is found to be outside the centre then the procedure is terminated without checking the other balls.

If PROCWIN returns E%=1 then the mainloop is terminated and a suitable comment is made depending on the value of T% from PROCTIME.

The data in lines 3110 to 3130 are the notes used in PROC MUSIC to produce an accompaniment to the game.

Users with a disc interface fitted may have a memory problem. It will be necessary to lower PAGE before running the program, or use a downloader routine.



**Listing starts  
on Page 152**







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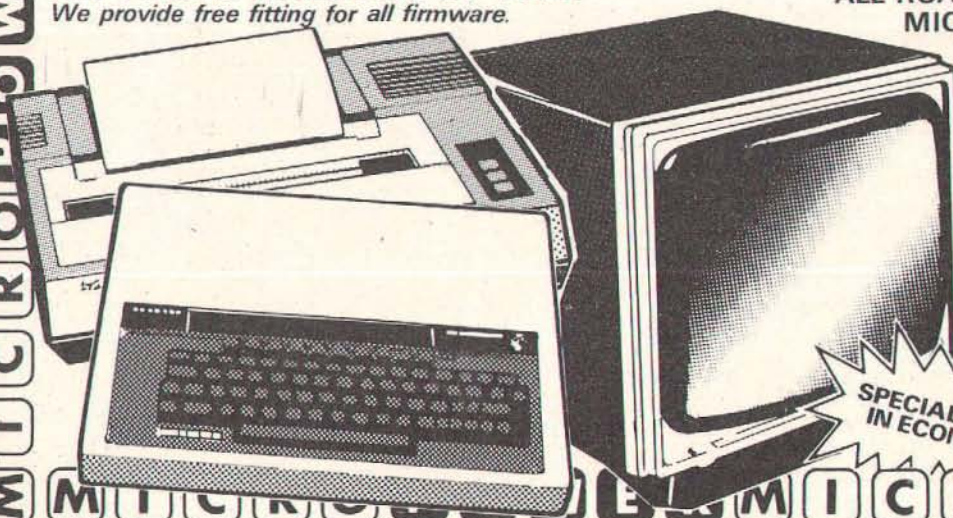
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# Tune in to a digital frequency meter

## THE BEEB BODY BUILDING COURSE

### Part 18

I HAVE had several letters from readers wanting to find some way to tune their guitars using the BBC Micro. This sounded a strange request at first and so I discussed it with the editor.

He must be a little more wily than we give him credit for, because he said the one thing guaranteed to make me tackle a project: "So you can't do it then?" Thus galvanised, I set out to see how it could be done.

The solution is to make the computer into a digital frequency meter. This is useful, not only for tuning instruments, but for all sorts of measurements such as hi-fi and general laboratory work.

I remember when I first went to work after leaving school, the pride and joy of the electronics lab was a digital frequency meter. It had a neon display that would "spin" and then briefly display the frequency before spinning around again.

At the time it cost the equivalent of a new Mini Cooper, but then electronics were expensive in 19\*\* (Blast, I must get this printer fixed).

The repetitive nature of the electronics needed for a frequency meter were ideally suited to implementation with integrated circuits, and before long it was possible to buy one on a single chip.

When setting out to convert the computer I initially thought of converting the signal into a DC voltage proportional to the frequency and then measuring it using the analogue input port. This only goes to show how wrong initial thoughts can be. It would have been quite inaccurate and required a fair bit of electronics to achieve.

The frequency of a signal is the number of cycles it goes through in one second. In the good old days this was measured in cps (units of cycles per second).

However when we joined the Common Market this was all too simple

for the French, and so the units of frequency were changed to Hertz, after a German physicist and part time renter of cars. The strange thing is that one Hz (Hertz) is defined as one cycle per second. Still, that's progress!

There are two methods of measuring frequency. First you can count how many cycles there are in a second, and secondly you can time how long it takes for one cycle and work out how many there would be in a second.

Both methods are possible using the computer, and they can be implemented

### By MIKE COOK

in several ways. The best is to use the facilities of the VIA (Versatile Interface Adaptor) which can be accessed from the user port.

The VIA contains two timers which can be used to measure frequency while the computer is getting on with something else. As we have not yet used these timers in earlier projects, it will be in order to say a little about them.

They are imaginatively called Timer 1 and Timer 2 and while they do similar jobs, they are not identical.

Timer 1 consists of two memory locations within the VIA (&FE64 and &FE65). These form a 16 bit number that is decremented every clock cycle.

As these memory locations are accessed at the same speed as the 1MHz bus, the number will be decremented once every 1µs. This happens automatically without the need for program intervention.

When these locations reach zero the VIA can generate an interrupt and a new number can be loaded in from Timer 1's latch register automatically.

The latch register (&FE66 and &FE67) is a sort of store used to remember the time interval you want

Timer 1 to use repeatedly. I say "can" because the timer can run in several different "modes" and these events will only occur if you have selected them.

The mode is determined by the bit pattern in the auxiliary control register (&FE6C). This location also controls the behaviour of Timer 2. The only reason why this may appear to be complicated is that, despite there being only a few events that can or can not happen, the number of combinations of events is large (256 combinations).

In addition to this, bit 7 of the B side of the User Port can be made to produce an output that changes with the state of the timer.

So this bit, along with the timer, may work continuously producing a square wave output whose period is twice that of Timer 1.

Alternatively, if the option not to reload the timers is chosen, it can produce a "single shot" pulse which lasts for the time given by Timer 1.

Timer 2 can operate in this same single shot mode, only using locations &FE68 and &FE69 to determine the time. There is no latch register for this timer and so it cannot be used on a continuous basis. Also no output is available (like bit 7 for Timer 1) to indicate the state of the timer.

It does however have one big advantage over Timer 1 in that it can be used as a counter. Instead of taking the computer's 1MHz E signal as the command to decrement a counter it can be programmed to use a signal that is fed into the VIA through bit 6 of the User Port.

So this timer can count external events and cause an interrupt after a predetermined number without any program intervention.

The VIA also contains a shift register controlled from the auxiliary control



## From Page 137

register, but as this is not needed here we will leave explanation of its operation for another day.

Figure 1 shows how the bits in this register control the operation of the two timers. Armed with this information we can see one method of measuring frequency.

If the signal we want to check is fed into bit 6 on the user port we can count every cycle that is made. This in itself will not give us a measure of frequency. What we need to do is to count how many cycles have occurred in a unit of time. This unit of time can be specified by Timer 1.

In addition, we can use the bit 7 output from Timer 1 to "gate" the signals going into Timer 2. Thus Timer 2 is only decremented while Timer 1 is counting.

The procedure is therefore to set Timer 2 to the maximum value, start Timer 1 going, and when it is timed out look at the value in Timer 2. This will tell us how many cycles it has received during the timer of Timer 1.

As you are doing this by computer it can then do the "sums" to extract the frequency in cycles per second, sorry Hertz.

The only thing that needs to be added to the computer is the device that lets pulses through to Timer 2 while Timer 1 is going. This turns out to be simplicity itself. Figure 2 shows how it is done. Surprised?

The signal to be measured is applied to the input and this turns the transistor on and off in time with the signal. However when bit 7 is high bit 6 will remain high as there is nothing to pull it down.

Only when bit 7 is low can the transistor switching on and off make the signal on bit 6 go high and low. Thus the circuit acts as a gate and only lets pulses

through during the period defined by Timer 1.

The signal must be large enough to turn the transistor on. Anything greater than about 1 volt will work.

A program to measure frequency in this way is given in Listing I. The section to start the measuring operation is in machine code although it would work equally well in Basic.

I have tucked it away in the RS232 buffer, but it can be moved anywhere to suit your own requirements.

Timer 1 is set to the maximum time of 64mS to allow as many pulses as possible to be counted. Thus, 64mS after the call to the subroutine is made the number of cycles counted is waiting for us in Timer 2's counter (&EF68 and &FE69).

As the input decrements the count rather than increments it what we actually have is our initial number, minus the number of cycles we have had. This is calculated in lines 280 to 310. The result is then printed on the

screen and the program loops round to measure the frequency again.

As Timer 2 only counts edges the number of pulses counted must be a whole number. This means that the count could be up to one count short. When this is multiplied up to find out how many pulses would have occurred in one second the result can be up to 16Hz in error. This is a constant and represents the resolution of the measurement.

Thus the percentage accuracy will be quite high for high frequencies (approaching 1MHz) and very low for frequencies below 100Hz. This is a factor of the "gate time" which, in our case, is 64mS.

If you want to measure really low frequencies accurately then you need a longer gate time. This cannot be achieved using Timer 1 but can be done using the computer's event timer. This allows an event routine to be called at intervals you can specify from the keyboard. The program will accept any

```

10 REM FREQUENCY COUNTER/TIMER
20 FOR AX=0 TO 3 STEP 3
30 PX=&A00
40 [
50 OPT AX
60 .SETUP
70 LDA #&A0 \T1 ONE-SHOT T2 COUNTD
OWN
80 STA &FE6B \AUX CONTROL REG
90 LDA #&FF
100 STA &FE68 \T2 INITIAL VALUE
110 STA &FE69
120 STA &FE64 \T1 LOW ORDER
130 STA &FE65 \T1 HI ORDER
140 RTS
150 ]
160 NEXT
170 CLS
180 PRINT"BEEB BODY BUILDING COURSE "
190 PRINT"FREQUENCY METER No. 1"
200 PRINT"By Mike Cook"
210 PRINT
220 PRINT"Counting the number of cy
cles in 64mS"
230 REPEAT
240 CALL SETUP
250 TIME=0
260 REPEAT
270 UNTIL TIME >8
280 AX=?&FE68
290 BX=?&FE69
300 CX=&FFFF-(AX+BX*256)
310 FX=INT(CX/.064)
320 PRINT TAB(0,13);"COUNT =" ;CX;SP
C(8)
330 PRINT "FREQUENCY =" ;FX;"Hz";SPC
(8)
340 UNTIL FALSE

```

Listing I

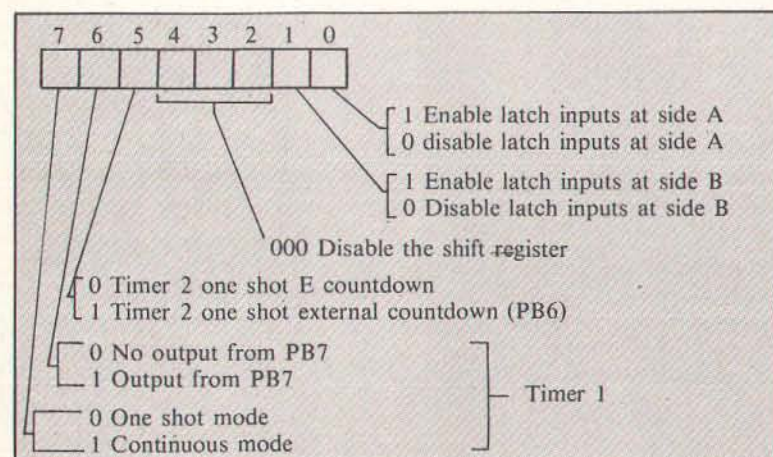


Figure I: Auxiliary control register &FE6B

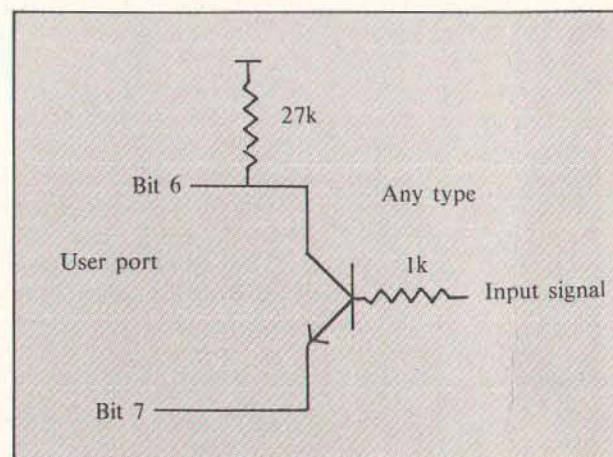


Figure II: Gating transistor



time greater than 0.06 seconds.

The event routine records the number left in Timer 2 in memory locations &7D and &7E and re-initialises the event timer. Listing II show how this can be done.

You can specify the gate time you require and get the corresponding level of accuracy. Bear in mind the total number of pulses received in the gate time must not be greater than 65,535 (&FFFF) otherwise Timer 2 will "wrap round" and start again.

Also when measuring really low frequencies (less than 10Hz) make sure that you have a good rise time on the signal. While testing I discovered that

only a square wave output from my signal generator gave a reliable result.

If you want to use low frequency sine waves you will have to square them up using a Schmitt trigger or saturating amplifier. In fact this program will work as an automatic background task even after you have pressed the Escape key.

To stop it totally you need to type \*FX13,5 or hit the Break key. This means that measurements can be taking place while the computer is doing something else. However it is relatively slow and requires many cycles to determine the frequency.

The result is that if the signal you are trying to measure changes frequency in

# THE BEEB BODY BUILDING COURSE

the course of measurement you will get an average frequency recorded. To prevent this you need to measure the

```

10 REM FREQUENCY COUNTER/TIMER 1a
20 *FX13,5
30 ?&FE62=&80
40 ?&FE6B=&20
50 FOR AX=0 TO 3 STEP 3
60 PZ=&A00
70 I
80 OPT AX
90 .CSTART \ASSUME IT IS OUR EVENT
100 LDA #&80
110 STA &FE60 \CLOSE GATE
120 LDA &FE6B \STORE COUNTER VALUE
130 STA &7D
140 LDA &FE69
150 STA &7E
160 LDA #&FF \RESET COUNTER
170 STA &FE6B
180 STA &FE69
190 LDX #&80 \POINT TO TIME VARIABLE
200 LDY #0

210 LDA #4 \EVENT TIMER WRITE
220 JSR &FFF1 \OSWORD ROUTINE
230 LDA #&1
240 STA &7F \INDICATE NEW READING
250 LDA #0
260 STA &FE60 \OPEN GATE
270 RTS
280 J
290 NEXT
300 CLS
310 PRINT"BEEB BODY BUILDING COURSE"

320 PRINT"FREQUENCY METER No. 1 a"
330 PRINT"By Mike Cook"
340 PRINT
350 REPEAT
360 INPUT"Enter the GATE time seconds ",G
370 GZ=G*100
380 UNTIL GZ>6
390 PRINT"Counting the number of cycles in ";GZ*10;"mS"
400 ?&220=CSTART MOD 256
410 ?&221=CSTART DIV 256
420 ?&84=&FF
430 !&80=-GZ
440 AZ=5
450 CALL CSTART
460 *FX14,5
470 REPEAT
480 ?&7F=0
490 REPEAT
500 UNTIL ?&7F=1
510 AZ=?&7D
520 BZ=?&7E
530 CZ=&FFFF-(AZ+BZ*256)
540 FX=INT(CZ/(GZ/100))
550 PRINT TAB(0,13);"COUNT=";CZ;SPC(8)
560 PRINT "FREQUENCY=";FX;"Hz";SPC(8)
570 UNTIL FALSE

```

Listing II

```

10 REM FREQUENCY TIMER 2
20 FOR AX=0 TO 3 STEP 3
30 PZ=&A00
40 I
50 OPT AX
60 .FREQ
70 SEI
80 LDX #&FF
90 LDA #0
100 STA &FE60 \OPEN THE GATE
110 JSR TRANSITION
120 STX &FE64
130 STX &FE65 \START TIMER
140 JSR TRANSITION
150 LDX &FE64
160 LDY &FE65 \GET COUNTER VALUES
170 STX &80
180 STY &81
190 LDA #&80
200 STA &FE60
210 CLI
220 RTS
230 .TRANSITION
240 LDA #&80
250 .LOOP1
260 BIT &FE60
270 BVC LOOP1
280 .LOOP2
290 BIT &FE60
300 BVS LOOP2
310 RTS
320 J
330 NEXT
340 CLS
350 PRINT"BEEB BODY BUILDING COURSE"
360 PRINT"FREQUENCY METER METHOD 2"
370 PRINT"By Mike Cook"
380 PRINT
390 PRINT"Timing one cycle 1 mS resolution"
400 ?&FE62=&80
410 ?&FE6B=0
420 CALL &A00
430 AZ=&FFFF-(?&80+?&81*100)
440 PRINT TAB(0,13);"TIME IS ";AZ;" MICROSECONDS";SPC(8)
450 F=INT((1/AZ)*1E06)
460 PRINT "FREQUENCY IS ";F;" Hz";SPC(8)
470 GOTO 420

```

Listing III



## From Page 139

time period of one cycle and then work out how many of these will fit into one second.

This can be done with a machine code routine as show in Listing III. It first opens the gate and waits until a transition of the input (bit 6) has been detected. Then Timer 1 is started and on the next transition the number left in Timer 1 is a measure of how long it took.

However, even in machine code there will have been some time delay between the transition and starting the timer, but this is compensated for, as approximately the same time delay exists between the transition and reading the timer. As the computer normally runs under continual interrupts these have to be disabled while the timing is taking place to prevent the computer "being somewhere else" when the signal makes a transition and thus not being able to start/stop the timer accurately.

This has the unfortunate side effect that the computer will hang up waiting for a transition if no signal is being applied to the input. If this happens, only the Break key will bring it back to life. Using this method you can measure frequencies from 200 KHz down to about 160Hz (period of 64mS). This lower limit is given by the maximum time that Timer 1 can be set to run.

If you want to measure even longer single cycles you can arrange for the signal to go into control line 1 on the user port and to generate an interrupt every time a transition is made.

Again the internal event timer can be read and the frequency calculated. This will only be accurate on low frequencies due to the 10 mS resolution of the event timer. I will leave this one as an exercise for you to try. It will have the advantage of not hanging up when no signal is present.

If you want to increase the sensitivity of the signal input you can add some additional gain before the gating transistor. One way of doing this is to use an operational amplifier in the way we have done in the past.

Figure III shows how this may be done using an LM324. It basically consists of two stages of amplification followed by a Schmitt trigger. As the operation of these elements have been described in a previous article there is no point in repeating it.

Also note there is no kit this month as the single transistor gating circuit is so simple it is just not worth laying out a printed circuit board.

Using the amplifier you can drive the input from an electric guitar and use it to tune it up as originally requested, but I have also been doing some experiments recording the frequencies produced.

Listing IV shows an automatic music plotting program. It is based around the gated counter method of frequency measurement and takes successive measurements and plots them out on a music stave. Then it plays back what you have just played to it.

To do this a list of notes with their corresponding frequencies are read into an array. Lines 80 to 170 do this. As we are to cover three octaves the frequencies are halved and first time through and doubled the last time, thus only one set of data is needed.

As the array contains the actual frequency of a note it is adjusted in lines 180 to 220 to contain a threshold frequency for the note so that we do not need to be spot on with our input.

The effect is that the program will choose the nearest note in the key of C to the one you play.

The next section of the program, lines 230 to 290, defines the shapes to make up the note. The first character (code 240) is actually the black hole in the middle of some notes.

# THE BEEB BODY BUILDING COURSE

Next the machine code routine is assembled and you are asked for the length of sequence you wish to record. The limit on this is set at line 40 and can be extended if you require.

The program then draws the music staves on the screen and plots the notes as you play them. It will only plot a note as it is finished, because it records the number of times it measures the input frequency and finds it the same to determine what note to plot on the stave.

As each note is plotted it is RECORDED in an array REC% for use when playing back the tune.

Finally, when the length of note sequence is reached, or the space bar is pressed, the tune is played back. If you want it can be repeated or you can try again.

I use the word tune very loosely, as the timing will inevitably be different from the original. I have tried it out with an input from my signal generator but not from any musical instruments and I make no promises about how good it is, only to say that it is "interesting"!

As an experiment I attached a microphone to the input and sang into it. The results were very interesting, but bore no relationship to what I sang.

There is obviously scope for further refinement here.

The major cause of difficulty was getting a good clean frequency signal from a source so rich in harmonics as the human voice. I found the vibrato kept coming through stronger than the fundamental frequency and this had the effect of putting in spurious notes.

Whistling was better, but I had to move the program up an octave as I tend to whistle at frequencies in excess of 1200Hz.

Nevertheless, it is great fun to try. It is very easy to turn the fact that it does not work very well into a feature - "It can be an aid to original composition".

Sing a well known tune into the computer and get something totally different out of it!

The single cycle timing method of

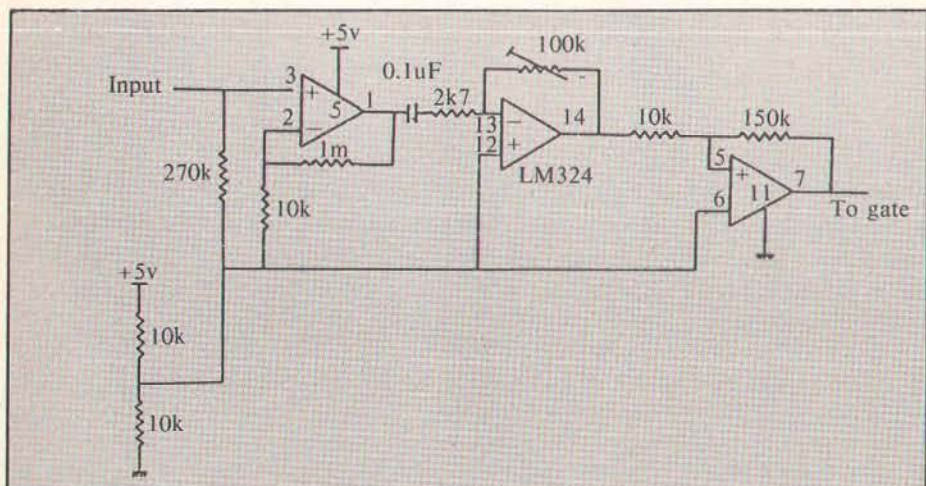


Figure III: Low level input signal amplifier

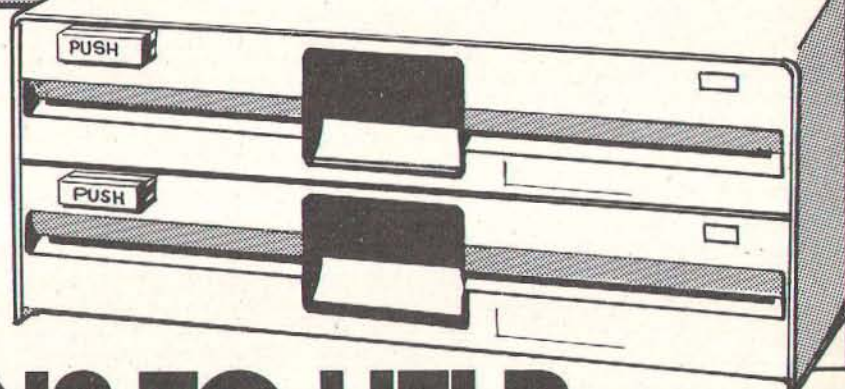


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# What the competition hasn't been waiting for.

Latest version of Forth for the BBC  
(Is not rehased Forth 79 Code)

Unique Stack Display Utility



16k Eprom type 27128

Multi-tasking operating system  
for Real-Time use.

Here's the Forth Eprom for the BBC Micro that makes all others out of date.

It's Multi-Forth 83 from David Husband who has built his reputation for Quality Forth products with his ZX81-Forth ROM, Spectrum Forth-I/O Cartridge and now New Multi-Forth 83 for the BBC Micro. This is not rehased Forth 79 Code, but a completely new version of the Forth 83 Standard. It's unique in that it Multi-tasks, and therefore the user can have a number of Forth programs executing simultaneously and transparently of each other.

Multi-Forth 83 sits in the sideways ROM area of the BBC along with any other ROMs in use. It is compatible with the MOS, and specially vectored to enable a system to be reconfigured. It contains a Standard 6502 Assembler, a Standard Screen Editor, and a Unique Stack Display Utility.

With this Forth, David Husband has provided the BBC Micro with capabilities never before realised. And being 16K rather than 8K is twice the size of other versions. Multi-Forth 83 is supplied with an

extensive Manual (170 pages plus) and at £40+VAT it is superb value.

Order it using the coupon adding £2.30 p&p (£5 for Europe, £10 outside) or if you want more information, tick that box instead. Either way, it will put you one step ahead of the competition.

Please send me Multi-Forth 83 for BBC Micro. £40+VAT. De-luxe System inc. Disc £80+VAT.  
Cheques to Skywave Software Readers' A/C (or enter Visa No.)

\_\_\_\_\_

Name: \_\_\_\_\_

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Please send me more information:  
☐ Multi-Forth 83  
☐ ZX81-Forth ROM  
☐ Spectrum Forth-I/O Cartridge

**Skywave SOFTWARE**

# MULTI-FORTH 83 FOR THE BBC MICRO



## From Page 140

frequency measurement could be incorporated into this program to snatch a single note. This might produce better results when using an instrument to input the tune.

The program could also be altered to allow editing of the tune once it has been entered, and you could get it to plot out the tune as it is played.

You could even modify it so that you

dispense with the frequency measuring part and enter a tune note by note from the keyboard.

For those interested in tuning, how about writing a program where the difference between your note and what you are aiming at is represented as a variable length line or other graphical means?

Like most Body Build articles I have given you the tools for the job—it is now up to you. See you next month.

# THE BEEB BODY BUILDING COURSE

```

10 REM AUTOMATIC MUSIC PLOTTER
20 REM By Mike Cook
30 RX=24
40 SMX=202
50 LASTX=1000
60 LX=0
70 DIM PITCH$(RX),TX(RX),REC$(1,SM
X),CODEX 30
80 FOR OCTIVEX=0 TO 2
90 RESTORE 1170
100 DX=OCTIVEX*8
110 FOR BX=1 TO RX/3
120 READ PITCH$(BX+DX)
130 READ TX(BX+DX)
140 IF OCTIVEX=0 THEN TX(BX+DX)=TX(
BX+DX)/2
150 IF OCTIVEX=2 THEN TX(BX+DX)=TX(
BX+DX)*2
160 NEXT
170 NEXT
180 REM ADJUST FREQUENCY THRESHOLD
190 FOR AX=1 TO RX-1
200 TX(AX)=TX(AX)+((TX(AX+1)-TX(AX)
)/2)
210 NEXT
220 TX(0)=TX(1)-50
230 VDU 23,240,0,0,0,0,0,0,254,0
240 VDU 23,241,3,2,2,2,2,58,124,56
250 VDU 23,242,2,2,2,2,2,58,124,56
260 VDU 23,243,2,2,2,2,2,58,124,57
270 VDU 23,244,2,2,2,2,2,58,68,56
280 VDU 23,245,0,0,0,0,0,56,68,56
290 VDU 23,246,2,2,2,2,2,58,68,57
300 FOR AX=0 TO 3 STEP 3
310 PX=CODEX
320 C
330 OPT AX
340 .FREQ
350 LDA #&A0
360 STA &FE6B
370 LDA #&FF
380 STA &FE68
390 STA &FE69
400 STA &FE64
410 STA &FE65
420 RTS
430 J

440 NEXT
450 MODE1
460 PRINT"BEEB BODY BUILDING COURSE
"
470 PRINT"AUTOMATIC MUSIC PLOTTER"
480 PRINT"By Mike Cook"
490 PRINT
500 PRINT"Using the user port to in
put sound"
510 PRINT
520 PRINT"You can terminate the seq
uence with"
530 PRINT"the space bar"
540 REPEAT
550 PRINT
560 NX=1
570 INPUT"INPUT SEQUENCE LENGTH",SL
X
580 SLX=SLX+1
590 IF SLX>SMX THEN PRINT"MAXIMUM "
;SMX-1;GOTO 570
600 CALL FREQ
610 GCOL 0,3
620 CLS
630 XZ=0
640 PROC_LINES(256)
650 REPEAT
660 F=INT((&FFFF-(?&FE68+?&FE69*256
))/0.064)
670 CALL FREQ
680 TIME=0
690 PRINT TAB(0,13);"FREQUENCY IS "
;F;" Hz";SPC(8)
700 REM SEARCH FOR NOTE
710 BX=-1
720 REPEAT
730 BX=BX+1
740 UNTIL TX(BX)>F OR BX=RX
750 PRINT "NOTE IS ";PITCH$(BX)
760 IF LASTX=BX THEN LX=LX+1 ELSE P
ROC_NOTE(LASTX,LX):LASTX=BX
770 IF LX=8 THEN PROC_NOTE(LASTX,8)
:LX=1
780 IF INKEY(-99) THEN SLX=NX
790 REPEAT:UNTIL TIME>6
800 UNTIL NX=SLX
810 *FX21,0

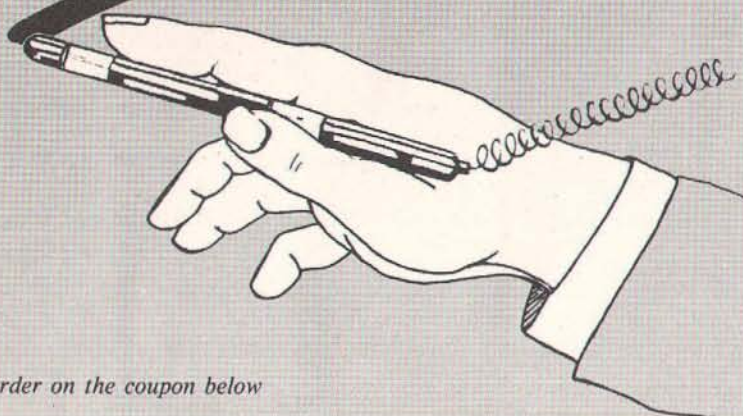
820 REPEAT
830 PROC_PLAY
840 PRINT TAB(0,27);"Press RETURN f
or a new sequence"
850 PRINT"Any other key to repeat t
une!"
860 AX=GET
870 UNTIL AX=13
880 UNTIL FALSE
890 DEF PROC_NOTE(BX,LX)
900 IF BX=0 THEN ENDPROC
910 REC$(0,NX)=BX
920 REC$(1,NX)=LX
930 NX=NX+1
940 PLACEX=192+BX*8
950 IF LX=5 THEN LX=6
960 IF LX=7 OR LX=8 THEN LX=5
970 VDU 5
980 MOVE XZ,PLACEX
990 VDU 18,0,0,240,8,18,0,1,240+LX,
4
1000 XZ=XZ+40
1010 IF XZ>1280 THEN CLS:GCOL0,3:PRO
C_LINES(256):XZ=0
1020 ENDPROC
1030 DATA "C",261.6256,"D",293.6648,
"E",329.6276
1040 DEF PROC_LINES(YX)
1050 FOR AX=1 TO 5
1060 MOVE 0,YX
1070 DRAW 1280,YX
1080 YX=YX+16
1090 NEXT
1100 ENDPROC
1110 DEF PROC_PLAY
1120 FOR AX=1 TO SLX-1
1130 SOUND 1,-9,REC$(0,AX)*8+5,REC$(
1,AX)
1140 SOUND 1,0,88,1
1150 NEXT
1160 ENDPROC
1170 DATA "C",261.6256,"D",293.6648
1180 DATA "E",329.6276,"F",349.2282
1190 DATA "G",391.9954,"A",440.000
1200 DATA "B",493.8833,"C",523.2511

```

Listing IV



# Make light work of it



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**USING a lightpen really DOES make light work of entering data into your BBC Micro.**

Painting on the screen or selecting options comes naturally with *The Micro User* lightpen.

Children in particular find it easy to communicate with a micro this way.

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- **Penbell** — an entertaining musical diversion.

All in all, *The Micro User* lightpen is a really versatile add-on for your BBC Micro, with lots of possibilities.

We'll be publishing lots of interesting applications for the lightpen in forthcoming editions of *Micro User*. But if you simply can't wait, incorporating a lightpen in your own programs is simplicity itself.

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## What the Beeb Body Building packs contain

Upgrade your BBC Micro with these Beeb Body Building Packs.

- **Packs 1 and 2:** These packs let you safely and simply interface your micro to the outside world.

- **Pack 3:** Give your Micro data-processing muscle by building a dual cassette system.

- **Packs 4 and 5:** Control mains equipment in complete electrical isolation. Pack 4 is rated at 4 amps, pack 5 at 10 amps.

- **Pack 6:** All the components for the Micro User light pen.

- **Pack 7:** Experiments to investigate pendulum behaviour and capacitor discharge.

- **Pack 8:** A versatile sound to pattern converter with many applications.

- **Pack 9:** Remember all those vital appointments with the help of this real time clock.

- **Pack 10:** A high speed A/D with many applications. For instance, turn your microcomputer into an oscilloscope!

- **Pack 11:** A pulse rate monitor. Ideal for keep-fit fanatics and experimenters alike.

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- **Pack 14:** Turn your micro into a communications terminal by building an acoustically coupled modem. (Handset retainer not included.)

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- **Pack 16:** The ribbon cable and socket needed for pack 15.

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# 4

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## Expandable console for the BBC Micro

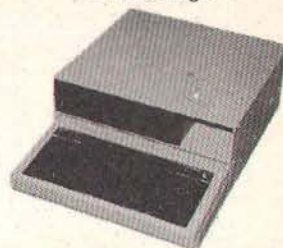
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Not just a monitor/tv stand but an expansion console which gives your micro the professional look. Protects and encloses your micro with room for disc drives and 2nd. processor or teletext adapter etc., all untidy connecting wires safely out of sight within the console. Made of light yet strong aluminium with a textured finish in matching BBC colour. Available now a bolt on extra module to the console for further expansion options. YES this console will grow with your needs.

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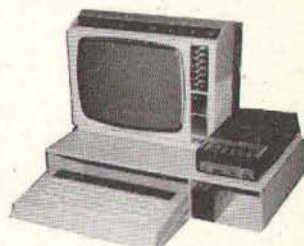


**Matching Printer Stand, can double for VDU Stand over the micro - only £14.99 + £2 carriage**

## ELECTRON CONSOLE

The console will house the ELECTRON and will safely support the expansion interfaces which will plug into the rear of the micro and will support the VDU at eye level. Tidies up all wiring between the micro, cassette and VDU. The console stores the cassette and tapes and will allow space for drives at a later date.

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**Datapen**

## BBC Lightpen Programs

**Datapen**



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### SUPERIOR PROGRAMS

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**PRICE £25.00**

Two drawing programs, SKETCH and SHAPE-CREATE are included with the lightpen and the programs shown above may be ordered additionally, or separately as required.

All prices above include VAT, postage and packing.

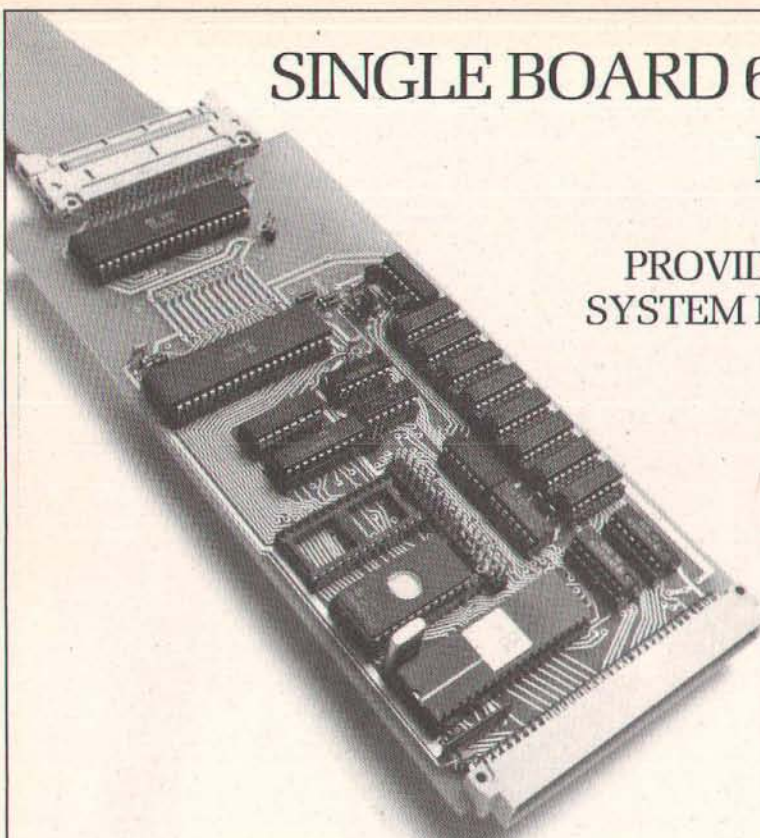
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Kingsclere Road, Overton,  
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## Number Signs listing

From Page 71

```

10 MODE 7
15 VDU23;8202;0;0;0;
20 PROCinit
30 PROCinstr
40 PROCtune
50 PROCname
55 REPEAT
56 PROCinit
60 MODE 2
65 VDU23;8202;0;0;0;
70 PROCcalc
80 PROCscreen
90 PROCgame
100 MODE 7
105 VDU23;8202;0;0;0;
110 PROCscore
120 UNTIL 0
130 DEFPROCinit
140 VDU 23,224,0,1,2,4,8,80,80,32,2
3,225,0,64,34,20,24,16,40,68
150 VDU 23,230,24,24,24,255,255,24,
24,24,23,231,0,0,0,255,255,0,0,0,23,2
32,195,231,126,60,60,126,231,195,23,2
33,24,24,0,255,255,0,24,24,23,234,0,1
26,126,0,0,126,126,0
160 SC=0:XX=6:YY=16:X=0:SY=5:SY=26:
R$="":delay=6250:BX=564:BY=457:level=
8
170 ENDPROC
180 DEFPROCinstr
190 PRINTTAB(10,1);CHR$(141);CHR$13
1"NUMBER SIGNS"TAB(10,2);CHR$(141);CH
R$134"NUMBER SIGNS"
200 PRINTTAB(0,7);CHR$134"Hello,"CH
R$131"the object of this game is for
"CHR$131"you to type in the correct
sign that "CHR$131"goes into the bo

```

x that will appear on "CHR\$131"the s  
creen when you are asked."

210 PRINT"CHR\$131"On the keyboard  
of the computer: "'CHR\$134"

"CHR\$131"means 'multiplies'"  
215 PRINTCHR\$134"/"CHR\$13

1"means 'divide'"CHR\$134" -  
"CHR\$131"means 'take away'"CHR\$134"  
+"CHR\$131"means 'add'"

220 PRINTTAB(10,20);CHR\$(141);CHR\$1  
34"GOOD-LUCK"TAB(10,21);CHR\$(141);CHR  
\$131"GOOD-LUCK"

230 \*FX 15,0

240 PRINTTAB(5,22);CHR\$131"Press"CH  
R\$134"any key"CHR\$131"to continue...."

"A\$=GET\$

250 ENDPROC

260 DEFPROCname

280 CLS:PRINTTAB(10,1);CHR\$(141);CH  
R\$131"NUMBER SIGNS"TAB(10,2);CHR\$(141  
);CHR\$134"NUMBER SIGNS"

290 SOUND -1,241,0,0:SOUND -1,192,0  
0:SOUND -1,290,0,0:SOUND -1,223,0,0

300 PRINTTAB(6,9)CHR\$131"Please ent  
er your name"TAB(8,10)CHR\$131"then pr  
ess Return"

305 PRINT TAB(11,12)CHR\$(145)"<,,,,"  
,,,,,,1"TAB(11,13);CHR\$(145);"5

j"TAB(11,14);CHR\$(145);"-,,,,,,,"  
,,,,"

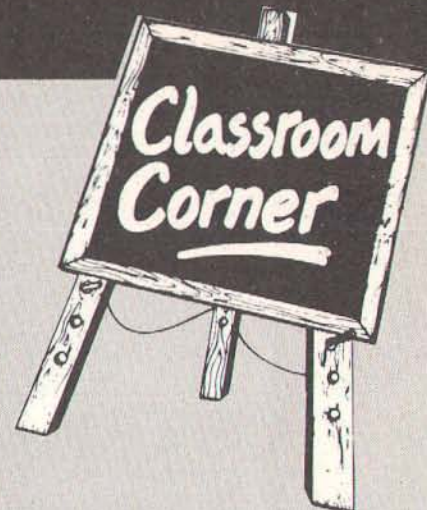
310 PROCdelay

320 A\$=FNinput("Z","A",7)

330 PRINTTAB((36-(LEN(TE\$)))/2,17);  
TE\$TAB(9,19)CHR\$136"I LIKE THAT NAME"

340\*FX15,0

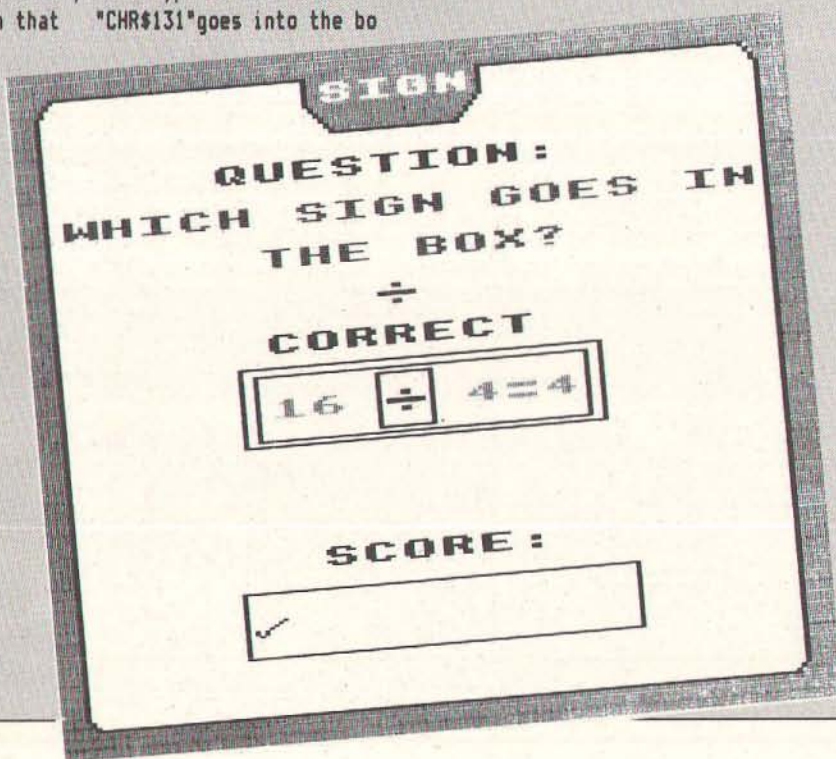
350 PRINTTAB(5,22)CHR\$131"Press"CHR  
\$134"any key"CHR\$131"to continue...."



```

:A$=GET$
360 ENDPROC
370 DEFPROCtune
380 FOR data=1 TO 7
390 READ pitch,duration
400 FOR notes=1 TO 3
410 SOUND notes,-15,pitch,duration
420 NEXT
430 NEXT
440 DATA 117,5,117,5,121,5,117,5,10
9,5,101,10,149,5
450 PROCdelay
460 ENDPROC
470 DEFPROCscreen
480 BCOL 0,5
490 MOVE 0,0:MOVE 0,100:PLOT 85,100
0:MOVE 1180,0:MOVE 1280,0:PLOT 85,12
80,100:MOVE 0,900:MOVE 0,1024:PLOT 85
,100,1024:MOVE 1280,900:MOVE 1280,102
4:PLOT 85,1180,1024:MOVE 0,0:MOVE 0,1
024:PLOT 85,40,0:PLOT 85,40,1024
500 MOVE 1280,0:MOVE 1280,1024:PLOT
85,1230,0:PLOT 85,1230,1024:MOVE 0,1
024:MOVE 1280,1024:PLOT 85,0,980:PLOT
85,1280,980:MOVE 0,0:MOVE 1280,0:PLO
T 85,0,40:PLOT 85,1280,40
510 MOVE 480,980:MOVE 770,980:PLOT
85,480,900:PLOT 85,770,900:BCOL 0,0:M
OVE 520,900:MOVE 480,900:PLOT 85,480,
940:MOVE 730,900:MOVE 770,900:PLOT 85
,770,940:BCOL 0,7
520 MOVE 60,40:DRAW 40,60:DRAW 40,9
50:DRAW 70,980:DRAW 480,980:DRAW 480,
940:DRAW 520,900:DRAW 730,900:DRAW 77
0,940:DRAW 770,980
530 DRAW 1200,980:DRAW 1230,950:DRA
W 1230,60:DRAW 1210,40:DRAW 60,40
540 VDU 5:MOVE 510,975:BCOL 0,4:PRI
NT"SIGN":VDU 4
550 BCOL 0,7:MOVE 315,128:DRAW 315,
224:DRAW 960,224:DRAW 960,128:DRAW 31
5,128
560 MOVE 362,450:DRAW 362,547:DRAW
904,547:DRAW 904,450:DRAW 362,450:MOV

```



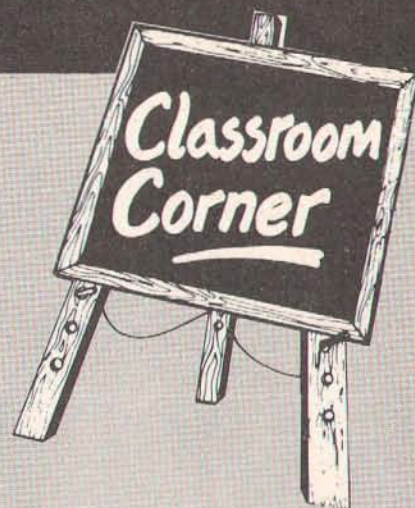


## Number Signs listing

### From Page 147

```
E 342,440: DRAW 342,557: DRAW 928,557: D
RAW 928,440: DRAW 342,440
570 ENDPROC
580 DEFPROC box (C%)
590 BCOL 0,C%
600 MOVE BX,BY: DRAW BX,BY+80: DRAW B
X+84,BY+80: DRAW BX+84,BY: DRAW BX,BY
610 ENDPROC
620 DEFPROC calc
630 A=RND(100): B=RND(100): CH=RN
D(4)
640 ON CH GOTO 650,670,720,740
650 IF A=2 AND B=2 THEN GOTO 630 EL
SE C=A+B: A$=CHR$(230): CH$="+ "
660 GOTO 760
670 IF A>B THEN C=A-B
680 IF B>A AND B<A THEN GOTO 630
690 IF B=A THEN GOTO 630
700 A$=CHR$(231): CH$="- "
710 GOTO 760
720 IF A=1 OR B=1 OR A=2 AND B=2 TH
EN GOTO 630 ELSE C=A*B: A$=CHR$(232): C
H$="*"
730 GOTO 760
740 IF B=1 THEN GOTO 630 ELSE IF A/
B=INT(A/B) THEN C=A/B: A$=CHR$(233): C
H$="/ "
750 A$=CHR$(233): CH$="/ "
760 IF A>=10 THEN X=1 ELSE X=0
770 XX=6: IF B>=10 OR C>=10 THEN: XX=
XX-1: BX=500 ELSE BX=564
780 IF A/B=C AND A-B=C THEN GOTO 63
0
790 ENDPROC
800 DEFPROC game
810 COLOUR 3: PRINTTAB(7,23): "SCORE:
"
820 FOR T=1 TO 10
830 TL$="Test for "+TE$
840 PROC box(0): PROC calc: PROC box(7)
850 PRINTTAB(6,16): " ": COLOUR 1: IF
X=1 THEN: PRINTTAB(X,Y): A ELSE PRINT
TAB(X+1,Y): A
860 PRINTTAB(X+5,Y): B: CHR$(234): C
870 COLOUR 3: PRINTTAB(5,5): "QUESTIO
N: ": COLOUR 4: PRINT: T: PRINTTAB(2,29):
TL$: COLOUR 6: PRINTTAB(1,7): "WHICH SIG
N GOES IN" TAB(6,9): "THE BOX?"
880 *FX 15,0
890 D$=BET$: IF D$=":" OR D$="," THE
N: COLOUR 12: SOUND 2,-15,88,8: SOUND 2,
-15,77,7: PRINTTAB(4,20): "PRESS SHIFT"
TAB(4,21): "AND THE KEY": FOR D=1 TO de
lay: NEXT: PRINTTAB(4,20): SPC(11) TAB(4,
21): SPC(12): COLOUR 7: GOTO 880
900 F=INSTR("x/-+ ",D$)
```

```
910 IF F=0 THEN GOTO 890
920 IF F=4 THEN P$=CHR$(230)
930 IF F=3 THEN P$=CHR$(231)
940 IF F=1 THEN P$=CHR$(232)
950 IF F=2 THEN P$=CHR$(233)
960 FOR DL=1 TO 2000: NEXT: PRINT TAB
(9,11): P$
970 IF D$=CH$ THEN M$="CORRECT": p=-
10: char=224: s=1 ELSE M$="WRONG": p=-2
: char=225: s=0
980 PROC message(M$,p,char,s)
990 NEXT
1000 ENDPROC
1010 DEFPROC message(N$,P,CHAR,S)
1020 *FX 15,0
1030 COLOUR 3: PRINTTAB(SX,SY): CHR$(C
HAR)
1040 SX=SX+1: SC=SC+S
1050 FOR sound=-15 TO 1 STEP 5
1060 SOUND 2,sound,sound*P,2: SOUND 3
,sound,sound*P,2: SOUND 1,sound,sound*
P,2
1070 NEXT
1080 IF X=1 THEN XX=9 ELSE XX=XX+3
1090 COLOUR 7: PRINTTAB(X,Y): P$: *FX
15,0
1100 COLOUR 9+14: ZX=(19-(LEN(N$)))/2
: PRINTTAB(ZX,13): N$
1110 IF S=0 THEN PRINTTAB(2,20): "THE
ANSWER IS ": A$
1120 PROC delay: PRINTTAB(ZX,13): SPC(L
EN(N$)): TAB(2,20): SPC(16)
1130 PROC box(0): PRINTTAB(7,16): SPC(7)
TAB(9,11): " "
1140 ENDPROC
1150 DEFPROC score
1160 PRINTTAB(10,1): CHR$(141): CHR$(131)
NUMBER SIGNS" TAB(10,2): CHR$(141): CHR$(13
4) "NUMBER SIGNS"
1170 IF SC<=2 THEN re$="NOT VERY GOOD
D"
1180 IF SC>2 AND SC<=5 THEN re$="FAI
R"
1190 IF SC>5 AND SC<=7 THEN re$="GOOD
D"
1200 IF SC>7 AND SC<=10 THEN re$="VER
Y GOOD"
1210 IF SC=10 THEN re$="EXCELLENT"
1220 PRINTTAB(4,8): CHR$(131) "Your score
was" CHR$(134): SC: CHR$(131) "out of" CHR$(13
4) "10"
1230 PRINTTAB(9,10): CHR$(134) "This was"
1240 PRINTTAB((35-(LEN(re$)))/2,12):
re$
1250 IF SC<=5 THEN PRINTTAB(6,14): CHR
$(131) "TRY HARDER NEXT TIME"
1260 PRINTTAB(6,16): CHR$(134) "DO YOU WA
NT ANOTHER GO?"
```



```
1270 PRINTTAB(17,19): G$=BET$: IF G$=
"Y" THEN: PRINTG$: ENDPROC ELSE: PRINTTA
B(12,19): CHR$(141): "BYE-BYE" TAB(12,20
): CHR$(141): "BYE BYE": END
1280 ENDPROC
1290 DEFN input(HI$,LO$,NU)
1300 LOCAL HI,LO,CO,EN,DE
1310 LOCAL RE,EN$
1320 *FX 15,0
1321 PRINTTAB(15,13): SPC(7) TAB(15,15
): SPC(7) TAB(2,19): SPC(40): TAB(10,21):
SPC(40): DE=127: RE=13: HI=ASC(HI$): LO=A
SC(LO$): CO=0: TE$="": REPEAT: REPEAT
1330 OK=FALSE: PRINTTAB(CO+15,13): EN
$=BET$: *FX 15,0
1340 EN=ASC(EN$)
1350 IF EN=32 THEN PRINT " ": CO=CO+1
1360 IF EN>=LO AND EN<=HI THEN OK=TR
UE
1370 UNTIL OK OR EN=DE OR EN=RE
1380 CO=CO+1: IF EN=DE AND CO>=1 THEN
: CO=CO-2
1390 IF EN=RE THEN CO=CO-1
1400 TE$=TE$+EN$
1410 IF EN<>RE THEN PRINTEN$:
1420 IF CO=NU THEN: PRINTTAB(2,19): CHR
$(131) "I CANNOT REMEMBER A NAME SO LONG
" TAB(10,21): CHR$(131) "PLEASE TRY AGAIN":
FOR DEL=1 TO 3000: NEXT: GOTO 1320
1430 UNTIL EN=RE
1440 IF EN=RE AND LEN(TE$)<=1 THEN :
PRINTTAB(2,19): CHR$(131) "YOU HAVE NOT TY
PED IN YOUR NAME" TAB(10,21): CHR$(131) "PL
EASE TRY AGAIN": FOR DEL=1 TO 3000: NEX
T: GOTO 1320
1450 PRINT
1460 =TE$
1470 DEFPROC delay: FOR DEL=1 TO delay
: NEXT: ENDPROC
```

*This listing is included in this month's cassette tape offer. See order form on Page 193.*



# wildings

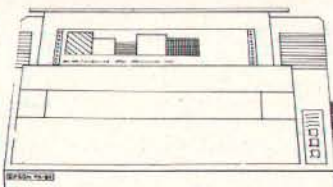
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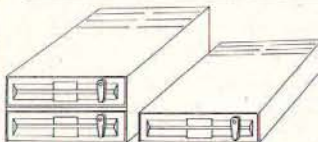
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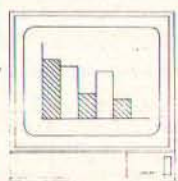
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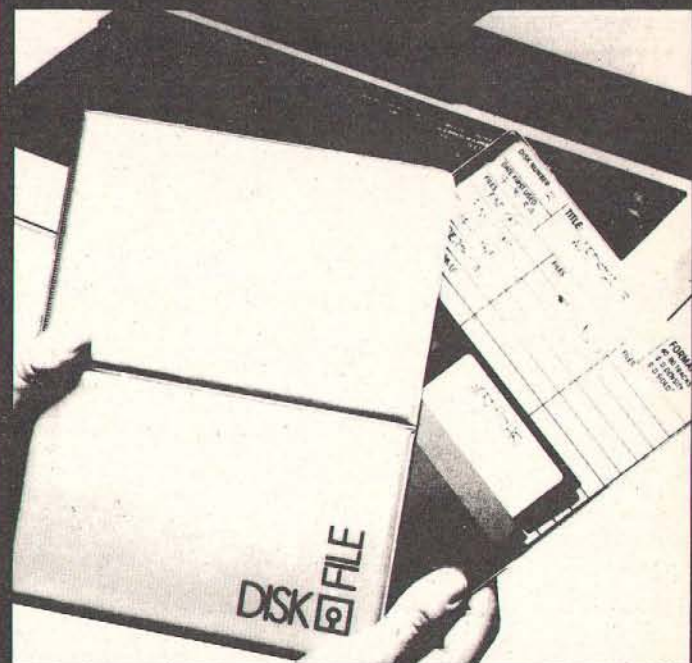
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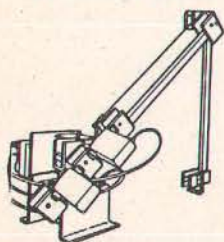
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# ROBOTICS

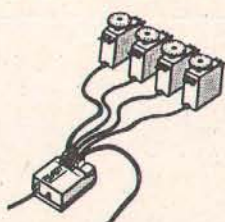
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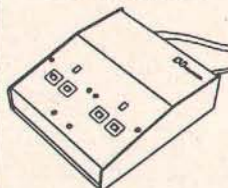
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## Rollerball listing

### From Page 133

```

10 REM *****
20 REM * ROLLERBALL *
30 REM * by *
40 REM * Geoff Turner *
50 REM * 1984 *
60 REM *****
70 *TV255
80 ON ERROR MODE 7
:REPORT
:PRINT " ";ERL
:END
90 P%=&D00
100 [
110 OPT2
120 SEI
130 LDA#128
140 LDX#250
150 JSR&FFF4
160 STX#70
170 CLI
180 RTS
190 ]
200 MODE 7
210 PROCINIT1
220 PROCINIT2
230 PROCINSTRUCTIONS
240 MODE 2
250 VDU 5
260 PROCSCREEN
270 TIME =0
280 PROCMAINLOOP
290 PROCEND
300 CLG
310 MODE 7
320 PRINT TAB(5,5);CHR$(131);"YOU
    TOOK ";TZ;" SECONDS"
330 PRINT
340 IF TZ>200
:C$="THAT WAS TERRIBLE !!!"
350 IF TZ<150
:C$="THAT WAS A POOR ATTEMPT"
360 IF TZ<120
:C$="THAT WAS QUITE GOOD"
370 IF TZ<80
:C$="THAT WAS VERY GOOD"
380 IF TZ<40
:C$="THAT WAS EXCELLENT"
390 IF TZ<20
:C$="YOU CHEATED !!! "
400 PRINT TAB(5,7);CHR$(133);C$
410 PRINT
420 PRINT TAB(6,10);"PLAY AGAIN
    (Y/N) ?"
430 PROCNMUSIC
440 *FX21,0
450 I$=INKEY$ (5)

```

The listings in this article are produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of *The Micro User*.

```

460 IF I$="Y" CLS
:GOTO 220
470 IF I$<>"N"
    THEN 430
480 CLS
:FX11,32
490 END
500 DEF PROCSCREEN
510 VDU 23,1,0;0;0;0;
520 GCOL 0,2
530 IF C%=3
    THEN VDU 19,2,0,0,0,0
540 XZ=0
:YZ=0
:AZ=1008
:BZ=1000
550 REPEAT
560 IF XZ>400
    THEN GCOL 0,3
570 MOVE XZ,YZ
580 DRAW XZ,BZ
590 DRAW AZ,BZ
600 DRAW AZ,YZ
610 DRAW XZ,YZ
620 XZ=XZ+64
:YZ=YZ+64
630 AZ=AZ-64
:BZ=BZ-64
640 UNTIL XZ>500
650 RESTORE 1710
660 GCOL 0,2
670 FOR IX=1 TO 7
680 READ AZ,BZ
690 MOVE AZ,BZ
700 DRAW AZ,BZ+56
710 NEXT
720 FOR IX=1 TO 7
730 READ AZ,BZ
740 MOVE AZ,BZ
750 DRAW AZ,BZ-56
760 NEXT
770 FOR I=1 TO 6
780 READ AZ,BZ
790 MOVE AZ,BZ
800 DRAW AZ+56,BZ
810 NEXT
820 FOR I=1 TO 5
830 READ AZ,BZ
840 MOVE AZ,BZ
850 DRAW AZ-56,BZ

```

```

860 NEXT
870 GCOL 0,0
880 FOR I=1 TO 7
890 READ AZ,BZ
900 MOVE AZ,BZ
910 DRAW AZ+64,BZ
920 NEXT
930 FOR I=1 TO 8
940 READ AZ,BZ
950 MOVE AZ,BZ
960 DRAW AZ+64,BZ
970 NEXT
980 FOR I=1 TO 9
990 READ AZ,BZ
1000 MOVE AZ,BZ
1010 DRAW AZ,BZ+64
1020 NEXT
1030 FOR I=1 TO 7
1040 READ AZ,BZ
1050 MOVE AZ,BZ
1060 DRAW AZ,BZ+64
1070 NEXT
1080 MOVE 480,552
1090 DRAW 480+48,552
1100 FOR IX=8 TO 11
1110 VDU 19,IX,7,0,0,0
1120 NEXT
1130 VDU 19,VZ+7,15,0,0,0
1140 VDU 19,HZ+7,15,0,0,0
1150 GCOL 0,11
1160 MOVE 1152,200
1170 DRAW 1152,304
1180 DRAW 1120,272
1190 MOVE 1152,304
1200 DRAW 1184,272
1210 GCOL 0,10
1220 MOVE 1152,200
1230 DRAW 1152,96
1240 DRAW 1120,128
1250 MOVE 1152,96
1260 DRAW 1184,128
1270 GCOL 0,9
1280 MOVE 1152,200
1290 DRAW 1048,200
1300 DRAW 1080,168
1310 MOVE 1048,200
1320 DRAW 1080,232
1330 GCOL 0,8
1340 MOVE 1152,200
1350 DRAW 1254,200
1360 DRAW 1222,232
1370 MOVE 1254,200
1380 DRAW 1222,168
1390 COLOUR 5
1400 VDU 4
1410 PRINT TAB(16,2);"Time";

```



# SPELLWISE

IS YORE SPELING REELY ATROSHUS?

Or is it just a littel bit off kei?

In either case you need

SPELLWISE.



- \* is a spelling checker for use with your BBC micro and WORDWISE word processor
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- \* contains an expandable dictionary of over 6000 words (disc) or 3000 words (tape)

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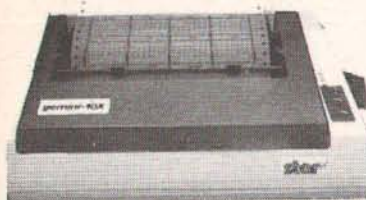
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**CONTEX COMPUTING (B9)**

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## Rollerball listing

### From Page 152

```

1420 PRINT TAB(16,6);"Secs";
1430 VDU 5
1440 ENDPROC
1450 DEF PROCINIT1
1460 VDU 5
1470 *FX11,0
1480 ENVELOPE 1,1,70,16,2,2,0,0
      ,126,0,0,-126,80,80
1490 ENVELOPE 2,1,0,0,0,0,0,0,126
      ,-4,0,0,50,25
1500 ENVELOPE 3,1,0,0,0,0,0,0,126
      ,-10,-5,-2,80,80
1510 DIM PX(5),QZ(5),XZ(5),YZ(5)
      ,NX(54),DX(54)
1520 VDU 23,224,112,248,248,248
      ,112,0,0,0
1530 VDU 23,225,112,248,232,192
      ,96,0,0,0
1540 VDU 23,226,96,192,232,248,112
      ,0,0,0
1550 VDU 23,227,112,248,184,24,48
      ,0,0,0
1560 VDU 23,228,48,24,184,248,112
      ,0,0,0
1570 QZ=0
1580 RESTORE 3110
1590 FOR IX=1 TO 54
1600 READ NX(IX),DX(IX)
1610 NEXT
1620 ENDPROC
1630 DEF PROCINIT2
1640 HZ=1
      :MX=16
      :VZ=4
      :NZ=8
      :DZ=2
      :EZ=0
      :CZ=0
1650 XZ(1)=16
      :YZ(1)=24
1660 XZ(2)=16
      :YZ(2)=992
1670 XZ(3)=960
      :YZ(3)=24
1680 XZ(4)=960
      :YZ(4)=992
1690 ENDPROC
1700 REM MAZE DATA
1710 DATA 208,4,800,4,608,68,256
      ,132
1720 DATA 674,132,512,196,576,324
1730 DATA 512,996,192,932,848,932
1740 DATA 528,868,704,804,640,740
1750 DATA 384,676,8,504,72,320,72
      ,720
1760 DATA 136,400,200,640,264,504

1770 DATA 1000,304,1000,800,936
      ,400
1780 DATA 872,600,746,400
1790 DATA 320,64,640,64,400,128
      ,800,128
1800 DATA 320,192,560,256,432,320
1810 DATA 320,936,640,936,224,872
1820 DATA 720,872,416,808,592,808
1830 DATA 400,744,560,680,64,96
      ,64,360
1840 DATA 64,608,128,504,128,752
      ,192,256
1850 DATA 192,496,256,320,384,480
1860 DATA 944,128,944,640,880,512
1870 DATA 816,256,752,624,688,480
1880 DATA 624,400
1890 DEF PROCMAINLOOP
1900 REPEAT
1910 PROCMUSIC
1920 IF CZ<>3
      THEN 1940
1930 IF INKEY (-102)
      THEN VDU 19,2,2,0,0,0,0
      ELSE VDU 19,2,0,0,0,0,0
1940 I$=INKEY$ (0)
      :IF I$=""
      THEN 2070
1950 GX=HZ
      :UX=VZ
1960 IF INKEY (-67) HZ=1
      :MX=16
      :GOTO 2000
1970 IF INKEY (-98) HZ=2
      :MX=-16
      :GOTO 2020
1980 IF INKEY (-105) VZ=3
      :NZ=8
      :GOTO 2000
1990 IF INKEY (-73) VZ=4
      :NZ=8
      :GOTO 2010
2000 IF HZ=1 AND VZ=3
      THEN DX=1
      :GOTO 2040
2010 IF HZ=1 AND VZ=4
      THEN DX=2
      :GOTO 2040
2020 IF HZ=2 AND VZ=3
      THEN DX=3
      :GOTO 2040
2030 IF HZ=2 AND VZ=4
      THEN DX=4
2040 IF GX<>HX VDU 19,GX+7,7,0,0
      ,0
2050 IF UX<>VZ VDU 19,UX+7,7,0,0
      ,0
2060 VDU 19,VZ+7,15,0,0,0
      :VDU 19,HZ+7,15,0,0,0

2070 FOR BX=1 TO LX
      :XZ=XZ(BX)
      :YZ=YZ(BX)
      :SZ=HZ
      :TZ=NZ
      :PROCHECK
      :GCOL 0,0
      :MOVE XZ(BX),YZ(BX)
      :VDU 224+DX
      :XZ(BX)=XZ(BX)+SX
      :YZ(BX)=YZ(BX)+TZ
      :MOVE XZ(BX),YZ(BX)
      :GCOL 0,1
      :VDU 224
      :NEXT
      :PROCTIME
      :PROCWIN
      :UNTIL EZ=1
2080 ENDPROC
2090 DEF PROCHECK
2100 ON DZ GOTO 2110 ,2200 ,2290
      ,2380
2110 IF POINT(XZ+48,YZ-12)<>0 SZ=0
      :GOTO 2150
2120 IF POINT(XZ+48,YZ-8)<>0 SZ=0
      :GOTO 2150
2130 IF POINT(XZ+48,YZ-16)<>0 SZ=0
      :GOTO 2150
2140 IF POINT(XZ+48,YZ-20)<>0 SZ=0
2150 IF POINT(XZ+24,YZ-24)<>0 TZ=0
      :ENDPROC
2160 IF POINT(XZ+16,YZ-24)<>0 TZ=0
      :ENDPROC
2170 IF POINT(XZ+32,YZ-24)<>0 TZ=0
      :ENDPROC
2180 IF POINT(XZ+40,YZ-24)<>0 TZ=0
2190 ENDPROC
2200 IF POINT(XZ+48,YZ+4)<>0 SZ=0
      :GOTO 2240
2210 IF POINT(XZ+48,YZ-8)<>0 SZ=0
      :GOTO 2240
2220 IF POINT(XZ+48,YZ)<>0 SZ=0
      :GOTO 2240
2230 IF POINT(XZ+48,YZ-4)<>0 SZ=0
2240 IF POINT(XZ+24,YZ+8)<>0 TZ=0
      :ENDPROC
2250 IF POINT(XZ+32,YZ+8)<>0 TZ=0
      :ENDPROC
2260 IF POINT(XZ+40,YZ+8)<>0 TZ=0
      :ENDPROC
2270 IF POINT(XZ+16,YZ+8)<>0 TZ=0
2280 ENDPROC
2290 IF POINT(XZ-16,YZ-12)<>0 SZ=0
      :GOTO 2330
2300 IF POINT(XZ-16,YZ-8)<>0 SZ=0
      :GOTO 2330

```



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## Rollerball listing

### From Page 155

```

2310 IF POINT(X%-16,Y%-16)<>0 S%=0
      :GOTO 2330
2320 IF POINT(X%-16,Y%-20)<>0 S%=0
2330 IF POINT(X%+8,Y%-24)<>0 T%=0
      :ENDPROC
2340 IF POINT(X%+16,Y%-24)<>0 T%=0
      :ENDPROC
2350 IF POINT(X%,Y%-24)<>0 T%=0
      :ENDPROC
2360 IF POINT(X%-8,Y%-24)<>0 T%=0
2370 ENDPROC
2380 IF POINT(X%-16,Y%-44)<>0 S%=0
      :GOTO 2420
2390 IF POINT(X%-16,Y%-8)<>0 S%=0
      :GOTO 2420
2400 IF POINT(X%-16,Y%)<>0 S%=0
      :GOTO 2420
2410 IF POINT(X%-16,Y%+4)<>0 S%=0
2420 IF POINT(X%+8,Y%+8)<>0 T%=0
      :ENDPROC
2430 IF POINT(X%+16,Y%+8)<>0 T%=0
      :ENDPROC
2440 IF POINT(X%,Y%+8)<>0 T%=0
      :ENDPROC
2450 IF POINT(X%-8,Y%+8)<>0 T%=0
2460 ENDPROC
2470 DEF PROCTIME
      :VDU 4
      :VDU 23,1,0;0;0;0;
      :COLOUR 5
      :TX=INT (TIME /100)
      :PRINT TAB(16,4);TX;
      :VDU 5
      :ENDPROC
2480 DEF PROCWIN
      :IX=1
2490 IF X%(IX)>448 AND X%(IX)<520
      AND Y%(IX)<560 AND Y%(IX)>464
      THEN IX=IX+1
      ELSE ENDPROC
2500 IF IX<>LX+1 GOTO 2490
2510 EX=1
      :ENDPROC
2520 DEF PROCEND
2530 SOUND 3,1,100,10
2540 FOR AX=0 TO 600
      :PROC MUSIC
      :NEXT
2550 ENDPROC
2560 DEF PROCINSTRUCTIONS
2570 PRINT TAB(9,0);CHR$(141);
      CHR$(129);"ROLLER BALL"
2580 PRINT TAB(9,1);CHR$(141);
      CHR$(129);"ROLLER BALL"
2590 PRINT TAB(8,3);CHR$(130);"By

```

Geoff Turner"

```

2600 PRINT ""
2610 PRINT "This game simulates a
      plastic maze"
2620 PRINT "with a number of ball
      bearings."
2630 PRINT
2640 PRINT "The object of the game
      is to tilt"
2650 PRINT "the maze and steer all
      the balls to"
2660 PRINT "the centre of the maze."
2670 PRINT
2680 PRINT "The game ends when all
      the balls"
2690 PRINT "have reached the central
      square."
2700 PRINT ""
2710 PRINT SPC(8);CHR$(133);"PRESS
      SPACE BAR."
2720 REPEAT
      : PROC MUSIC
      : UNTIL INKEY (-99)
2730 REPEAT
      : PROC MUSIC
      : UNTIL NOT INKEY (-99)
2740 CLS
2750 PRINT ""
2760 PRINT "Tilt the maze using the
      following keys."
2770 PRINT
2780 PRINT SPC(9);CHR$(134);"Z
      tilts left"
2790 PRINT SPC(9);CHR$(134);"X
      tilts right"
2800 PRINT SPC(9);CHR$(134);"*
      tilts up"
2810 PRINT SPC(9);CHR$(134);"?"
      tilts down"
2820 PRINT
2830 PRINT "The direction of tilt
      is shown by"
2840 PRINT "the arrows at the bottom
      right of"
2850 PRINT "the screen."
2860 PRINT
2870 PRINT "The time taken is shown
      by the clock"
2880 PRINT "at the top of the screen."
      "
2890 PRINT ""
2900 PRINT SPC(8);CHR$(133);"PRESS
      SPACE BAR"
2910 REPEAT
      : PROC MUSIC
      : UNTIL INKEY (-99)
2920 REPEAT
      : PROC MUSIC

```

:UNTIL NOT INKEY (-99)

```

2930 CLS
2940 PRINT ""
2950 PRINT "Choose your skill level"
2960 PRINT
2970 PRINT CHR$(130);"1. Easy
      - two balls"
2980 PRINT CHR$(130);"2. Hard
      - four balls"
2990 PRINT CHR$(130);"3. Impossible
      - invisible maze"
3000 PRINT ""
3010 PRINT "When using the invisible
      maze press"
3020 PRINT "key 'M' to make the maze
      visible"
3030 PRINT ""
3040 PRINT CHR$(130);"CHOOSE 1,2
      or 3. ";
3050 *FX21,0
3060 REPEAT
      :C$=INKEY$(0)
      :PROC MUSIC
      :UNTIL C$="1" OR C$="2"
      OR C$="3"
3070 CX=VAL(C$)
3080 IF CX=1
      THEN LX=2
      ELSE LX=4
3090 ENDPROC
3100 REM MUSIC DATA
3110 DATA 69,2,77,1,69,1,65,1,57
      ,1,49,2,37,2,57,2,29,2,17,2
      ,49,2,57,1,49,1,57,1,65,1,69
      ,2,69,2,77,1,69,1,65,1,57,1
3120 DATA 49,2,37,2,57,2,29,2,17
      ,2,49,2,57,6,69,2,69,2,69,2
      ,45,2,45,2,45,2,77,2,77,2,77
      ,2
3130 DATA 65,2,65,1,69,1,65,2,85
      ,2,85,1,77,1,85,2,45,2,45,1
      ,37,1,45,2,65,2,57,2,49,2,49
      ,2,57,4
3140 DEF PROC MUSIC
      :CALL &D00
      :IF ?&70=0 ENDPROC
3150 QX=QX+1
      :IF QX=55 QX=1
3160 SOUND 1,2,NZ(QX)+100,DZ(QX)*3
      :SOUND 2,3,NZ(QX)+80,DZ(QX)*3
      :ENDPROC

```

*This listing is included in this month's cassette tape offer. See order form on Page 193.*



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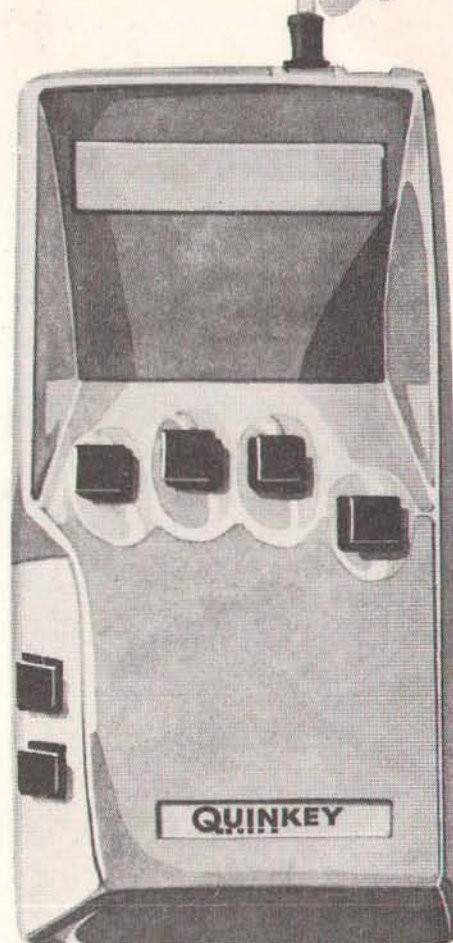
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## HOW CAN 6 KEYS DO THE WORK OF 72?

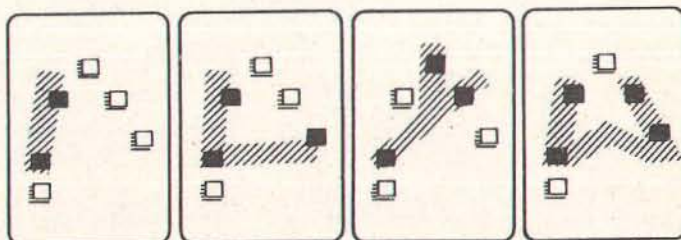
You simply press the keys in different combinations. Each combination represents a character.

Quinkey has 5 keys plus a Control key, each finger belonging to its own key — so there's no need to hunt and peck ... BUT ...



## ... HERE'S THE MAGIC!

Look at these diagrams:



See how the lines joining the key combinations form the characters? For each letter there's an instantly recognised and easily memorised visual clue.

That's the trick — and it works!



## YOU CAN TRY IT NOW!

Rest the fingers of your right hand on a table top. Imagine the keys.

To write an "I" you press your Thumb and Index finger down at the same time.

For an "L" you press your Thumb, Index and Little fingers.

To write "Y" you use your Thumb, Middle and Ring fingers... and so on.

That's all there is to it.

Here's what users are saying about the keyboard:

— PETER RODWELL (as Editor of 'Personal Computer World') "took me half an hour to learn the alphabet... far easier than learning to type. It's an addictive device, and I'm starting to wonder how I ever managed without one."

— PETER WHEELER (in the 'Times Educational Supplement') "a new user can start to touch type after one hour's usage."

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"PROG" and "WP" (free with the Quinkey package) are utility programs written specially for the BBC.

"PROG" enables your BBC to recognise and interpret the signals from the Quinkey keyboard. It combines easily with your application programs enabling you to use Quinkey as a comprehensive alternative keyboard.

"WP" optimises Quinkey to work with word-processing packages "Wordwise," "View" and "Edword" — a perfect text-writing combination.

## KEYBOARD RANGE.

All BBC "B" keyboard inputs generate from the Quinkey, except the hard-wire key, "Break."

### TECHNICAL DATA:

Loading length: &605. Running length: &300.  
No zero-page locations, all ADC channels.  
Interrupt service vector IRQ2V, correctly chained.

### TESTED COMPATIBILITY

BBC Model "B"

Acorn

OS 1.2

BASIC I or BASIC II (unless using INKEY with negative argument)

Acorn

DFS 0.90

Acorn

View A1.4

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Wordwise 1.17

Computer Concepts

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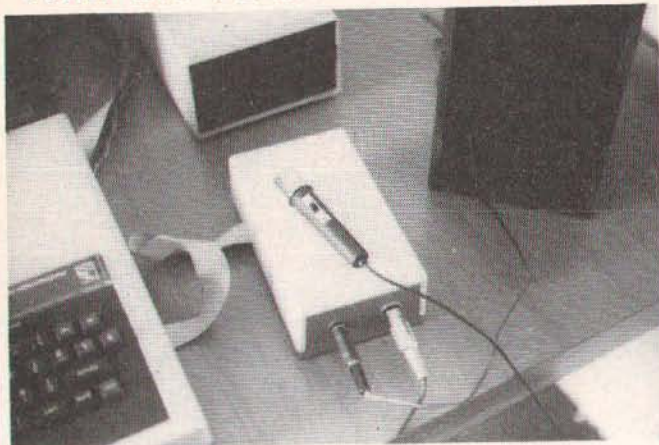
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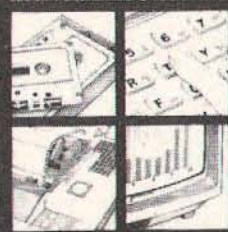
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## Villains listing

### From Page 99

```

5 REM (c) The Micro User
10 *FX9,8
20 *FX10,8
30 PROCinit
40 ONERRORMODE7:PROCerr
50 MODE7:PROCinstruct:MODE2:VDU23;
8202;0;0;0;VDU5
60 PROCvar:PROCscreensetup:REPEAT:
RZ=RND(4):PROCscore
70 IFRZ=1PROCvillain(16,4)
80 IFRZ=2PROCvillain(24,2)
90 IFRZ=3PROCassassin
100 IFRZ=4PROCchugo
110 IFmenZ<0GOSUB1000
120 IFkilledZ=0PROCwave
130 UNTILFALSE
140 DEFPROCvar:FORcolZ=1TO4:goldZ(c
olZ)=1:NEXT:goldposZ(1,1)=616:goldpos
Z(1,2)=638:goldposZ(2,1)=806:goldposZ
(2,2)=448:goldposZ(3,1)=616:goldposZ(
3,2)=258:goldposZ(4,1)=426:goldposZ(4
,2)=448
150 xposZ(1)=1060:xposZ(2)=156:ypos
Z(1)=220:yposZ(2)=739:XZ=640:YZ=448:R
Z=RND(4):menZ=7:printZ=1:scoreZ=0:hug
oZ=36:speedZ=32:CZ=speedZ:killedZ=13:
waveZ=0:distZ=360:ENDPROC
160 DEFPROCscreensetup:GCOL0,4:MOVE
100,795:DRAW1180,795:DRAW1180,100:DRA
W100,100:DRAW100,795:GCOL0,1:MOVE100,
1000:DRAW1180,1000:DRAW1180,800:DRAW1
00,800:DRAW100,1000:VDU24,108;108;117
2;787;:PROCbars:VDU4:COLOUR4
170 PRINTTAB(2,2);"SCORE:";TAB(2,5)
;"ENERGY:";COLOUR1:FORcolZ=9TO16:PRIN
TTAB(colZ,5);CHR$250:NEXT:VDU5:ENDPRO
C
180 DEFPROCkey:PROCbar
190 IF(?&C OR?&ED)=0PROCman:ENDPRO
C
200 IFINKEY(-98)CZ=-speedZ:PROCmove
x
210 IFINKEY(-67)CZ=speedZ:PROCmovex
220 IFINKEY(-88)DZ=speedZ:PROCmovey
230 IFINKEY(-104)DZ=-speedZ:PROCmov
ey
240 IFINKEY(-99)PROCgun
250 ENDPROC
260 DEFPROCmovex:IF(XZ+CZ)>1108OR(X
Z+CZ)<108ENDPROC
270 PROCwipe(XZ,YZ):XZ=XZ+CZ:PROCma
n:ENDPROC
280 DEFPROCmovey:IF(YZ+DZ)>787OR(YZ
+DZ)<172ENDPROC
290 PROCwipe(XZ,YZ):YZ=YZ+DZ:PROCma
n:ENDPROC
300 DEFPROCgun:SOUND17,4,230,29:SOU
ND16,-15,7,29:FORcolZ=4TO0STEP-4:MOVE

```



```

(XZ+32)+(SGN(CZ)*32),(YZ-24):GCOL3,1:
PLOT1,SGN(CZ)*1030,0:PROCdelay(colZ):
NEXT:IFABS((YZ-26)-(YZ-32))<32AND(SGN
(xZ-XZ)=SGN(CZ)):RZ=0
310 ENDPROC
320 DEFPROCvillain(stepZ,colourZ):B
Z=1:REPEAT:colZ=RND(4):UZ=goldposZ(co
lZ,1):VZ=goldposZ(colZ,2):UNTILgoldZ(
colZ)>0:varZ=colZ:colZ=RND(2):xZ=xpos
Z(colZ):colZ=RND(2):yZ=yposZ(colZ):AZ
=2:REPEAT
330 IFAZ=3colZ=RND(2):UZ=xposZ(colZ
):colZ=RND(2):VZ=yposZ(colZ):VDU25,4,
goldposZ(varZ,1):goldposZ(varZ,2);18,
0,0,250:goldZ(varZ)=0:AZ=4
340 PROCchome:IFmenZ=0PROCkey
350 IFAZ=4ANDABS(UZ-xZ)<=48ANDABS(V
Z-yZ)<=48BZ=0
360 UNTILRZ=0OR BZ=0 OR menZ<0:PROC
wipe(xZ,yZ):IFRZ=0scoreZ=scoreZ+80:ki
lledZ=killedZ-1:IFRZ=0ANDAZ=4VDU25,4,
xZ;yZ-32;18,0,8,251,8,18,0,15,252:gol
dposZ(varZ,1)=xZ:goldposZ(varZ,2)=yZ-
32:goldZ(varZ)=1
370 IFBZ=0UZ=0:FORcolZ=1TO4:UZ=UZ+g
oldZ(colZ):NEXT:IFUZ=0menZ=-2
380 ENDPROC
390 DEFPROCchome:PROCwipe(xZ,yZ):xZ=
xZ+(SGN(UZ-xZ)*(stepZ*AZDIV2)):yZ=yZ+
(SGN(VZ-yZ)*(stepZ*AZDIV2)):VDU25,4,x
Z;yZ;:IFAZ=2PROCvdu ELSEPROCvdu1
400 colZ=RND(17):IFcolZ=8PROCshoot
410 IFAZ=2ANDABS((UZ+12)-(xZ+32))<4
ANDABS((VZ-8)-(yZ-32))<40AZ=3
420 ENDPROC
430 DEFPROCvdu:VDU18,0,colourZ,244,
8,18,0,3,245,8,18,0,1,246,10,8,18,0,c
olourZ,247,8,18,0,1,248:ENDPROC
440 DEFPROCvdu1:VDU18,0,colourZ,244
,8,18,0,3,245,8,18,0,1,246,10,8,18,0,
8,251,8,18,0,15,252,8,18,0,1,253,8,18
,0,colourZ,254:ENDPROC
450 DEFPROCshoot:spare1Z=(31-RND(62
))*8:FORcolZ=5TO0STEP-5:MOVE(xZ+32),(
yZ-16):GCOL3,5:SOUND10,0,0,5:SOUND1
1,1,255,5:DRAW(XZ+32)+spare1Z,(YZ-32)
+spare1Z:PROCdelay(colZ):NEXT:IFABSsp

```

```

are1Z<32PROCchit
460 ENDPROC
470 DEFPROCchit:menZ=menZ-1:VDU19,0,
7;0;VDU4:COLOUR0:PRINTTAB(10+menZ,5)
;CHR$250:VDU5
480 VDU19,0,0;0;ENDPROC
490 DEFPROCdelay(aZ):TIME=0:REPEATU
NTILTIME>aZ:ENDPROC
500 DEFPROCassassin:yZ=YZ:AZ=0:IFXZ>
=640xZ=120:BZ=40ELSExZ=118:BZ=-40
510 UZ=xZ:spare1Z=xZ:REPEAT:IFABS(s
pare1Z-xZ)<distZANDAZ=0PROCrun ELSE P
ROCfire
520 IFmenZ=0PROCkey
530 UNTILABS(UZ-xZ)<40ORRZ=0ORmenZ<
0:PROCwipe(xZ,yZ):IFRZ=0scoreZ=scoreZ
+100:killedZ=killedZ-1
540 ENDPROC
550 DEFPROCassass:VDU25,4,xZ;yZ;18,
0,4,229+(5*SGN(BZ)),8,18,0,7,230+(5*SG
N(BZ)),8,18,0,1,231+(5*SGN(BZ)),10,8
,18,0,4,232+(5*SGN(BZ)),8,18,0,1,233+
(5*SGN(BZ)):ENDPROC
560 DEFPROCrun:PROCwipe(xZ,yZ):xZ=x
Z+BZ:PROCassass:ENDPROC
570 DEFPROCfire:IFAZ=0AZ=RND(5)+5
580 colZ=SGN(2-(RND(5)-1))*16:IFABS
((yZ+colZ)-480)>306colZ=0
590 PROCwipe(xZ,yZ):yZ=yZ+colZ:PROC
assass:SOUND10,2,6,4:FORcolZ=4TO0STE
P-4:MOVExZ+32+(SGN(BZ)*32),yZ-28:GCOL
3,5:PLOT1,SGN(BZ)*640,0:PROCdelay(col
Z):NEXT:IFABS((yZ-26)-(YZ-32))<32PROC
hit
600 AZ=AZ-1:IFAZ=0BZ=-8:spare1Z=sp
are1Z-(SGN(BZ)*40)
610 ENDPROC
620 DEFPROCgameover:PROCdelay(70):S
OUND17,5,230,91:SOUND16,-15,7,91:IFme
nZ=-2VDU4:COLOUR0:FORcolZ=9TO16:PRIN
TAB(colZ,5);CHR$250:NEXT:VDU5
630 FORcolZ=1TO90:MOVEXZ+32,YZ-32:R
EPEAT:varZ=RND(3):UNTILvarZ<2:GCOL0,
varZ:DRAWNRND(1000),RND(1000):NEXT:PRO
Cdelay(425):ENDPROC

```



## Villains listing

### From Page 161

```
640 DEFPROCman:VDU25,4,X%,Y%;18,0,7
,234+(5*SGN(C%)),8,18,0,1,235+(5*SGN(
C%)),8,18,0,3,236+(5*SGN(C%)),8,18,0,
4,237+(5*SGN(C%)),10,8,18,0,1,238+(5*
SGN(C%)):ENDPROC
```

```
650 DEFPROCbar:IFgold%(print%)=0GOT
0660ELSEVDU25,4,goldpos%(print%,1);go
ldpos%(print%,2);18,0,8,251,8,18,0,15
,252
```

```
660 print%=print%+1:IFprint%=5print
%=1
```

```
670 ENDPROC
```

```
680 DEFPROCchugo:B%=1:A%=hugo%:V%=16
:col%=RND(2):IFcol%=1x%=150ELSEx%=106
6
```

```
690 IFY%>450y%=Y%-(RND(3)*75)ELSEy
%=Y%+(RND(3)*75)
```

```
700 REPEAT:IFAX%>0AX%=AX-1ELSEAX%=-1:V
%=SGN(Y%-Y%)*40
```

```
710 PROCmovehugo:IFB%>0PROCkey
```

```
720 UNTILB%=0R%=0:PROCwipe(x%,y%
):IFB%=0ANDspeed%>4speed%=speed%-7
```

```
730 IFR%=0score%=score%+50:killed%=
killed%-1
```

```
740 ENDPROC
```

```
750 DEFPROCmovehugo:IFAX%>0V%=-V%
```

```
760 IFABS((Y%-32)-(Y%-32))<32ANDAX(
=0PROCchugofire
```

```
770 PROCwipe(x%,y%):y%=y%+V%:VDU25,
4,x%,y%;18,0,7,249,8,18,0,4,255,8,18,
0,1,246,10,8,18,0,4,247,8,18,0,1,248:
ENDPROC
```

```
780 DEFPROCchugofire:SOUND&10,0,0,5:
SOUND&11,3,200,10:FORcol%=12TO0STEP-1
2:VDU25,4,x%+32;y%-32;25,4,X%,Y%+10;:
BCOL3,2:PLOT85,X%,Y%-74:PROCdelay(col
%):NEXT:B%=0:ENDPROC
```

```
790 DEFPROCwave:X%=640:Y%=448:wave%
=wave%+1:killed%=13+(wave%*2):CL6:MOV
E450,700:BCOLO,RND(6):PRINT"wave ";wa
ve%:MOVE370,600:PRINT"COMPLETED":U%=0
:FORcol%=1TO4:IFgold%(col%)=1 U%=U%+1
```

```
800 IFhugo%>0hugo%=hugo%-2
```

```
810 NEXT:MOVE370,500:PRINT"BONUS x
";U%:score%=score%+(RND(4)*100*U%):FO
Rcol%=1TOU%:MOVE365+(col%*100),400:VD
U18,0,8,251,8,18,0,15,252:NEXT:IFdist
%>40dist%=dist%-40
```

```
820 IF(wave%/3)=INT(wave%/3)ANDmen%
<7 BCOLOR,12:MOVE400,300:PRINT"+ ENERB
Y":men%=7:speed%=32:VDU4:COLOUR1:FORc
ol%=9TO16:PROCdelay(5):PRINTTAB(col%,
5):CHR$250:NEXT:VDU5
```

```
830 PROCdelay(500):CL6:PROCman:PROC
bars:ENDPROC
```

```
840 DEFPROCscore:VDU4:COLOUR1:PRINT
TAB(9,2):score%:VDU5:ENDPROC
```

```
850 DEFPROCbars:FORcol%=1TO4:IFgold
```



```
Z(col%)=1VDU25,4,goldpos%(col%,1);gol
dpos%(col%,2);18,0,8,251,8,18,0,15,25
2
```

```
860 NEXT:ENDPROC
```

```
870 DEFPROCchitable
```

```
880 *FX15,0
```

```
890 VDU23;8202;0;0;0;:IFscore%<HIX(
5) GOTD950
```

```
900 U%=0:REPEAT:U%=U%+1:UNTILscore%
>=HIX(U%)
```

```
910 IFU%=5 GOTD930
```

```
920 FORcol%=5TO U%STEP-1:HIX(col%)=
HIX(col%-1):HI$(col%)=HI$(col%-1):NEX
T
```

```
930 HIX(U%)=score%:PRINT"CHR$130"YO
U ARE RANKED NUMBER ";U%;"CHR$129"WE
LL DONE!":INPUT"PLEASE TYPE IN YOUR
NAME.. ";A$:IFLEN(A%)>8 A%=LEFT$(A%,8
)
```

```
940 HI$(U%)=A%
```

```
950 CLS:A%=CHR$132+CHR$157+CHR$129+
CHR$141+CHR$130+" VILLAINS HALL O
F FAME":PRINTTAB(0,3);A%;TAB(0,4);A%
```

```
960 FORcol%=1TO5:PRINTTAB(9,col%+8)
;CHR$(128+RND(6));HIX(col%);STRING$(2
0-LEN(HI$(col%))+LEN(STR$(HIX(col%))
),".");HI$(col%):NEXT:PRINTTAB(9,17)
;CHR$133"Another Game ? (Y/N)"
```

```
970 A%=GET$:IFINSTR("YyNn",A%)=0VDU
7:GOTD970
```

```
980 CLS:IFA%="N" OR A%="n"END ELSE
ENDPROC
```

```
990 DEFPROCwipe(a%,b%):VDU25,4,a%;b
%;18,0,0,250,10,8,250:ENDPROC
```

```
1000 PROCgameover:MODE7:PROCchitable:
PROCinstruct:MODE2:VDU23;8202;0;0;0;:
VDU5:PROCvar:PROCscreensetup:RETURN
```

```
1010 DEFPROCinstruct:A%=CHR$132+CHR
$157+CHR$129+CHR$141+CHR$130+"
VILLAINS":PRINTTAB(0,3);A%;TAB(0,
4);A%;TAB(15,6)CHR$129"KEYS:";TAB(13
,10)CHR$133"Z...LEFT";TAB(13,12)CHR$
133"X...RIGHT"
```

```
1015 PRINTTAB(13,14)CHR$133"+...UP"
;TAB(13,16)CHR$133">...DOWN"
```

```
1020 PRINTTAB(13,18)CHR$133"<SPACE>
...FIRE";TAB(7,21)CHR$129;CHR$136"PR
ESS <SPACE> TO START":REPEATUNTILGET
$=" ":ENDPROC
```

```
1030 DEFPROCerr:IFERR(>17 REPORT:PRI
NT" at line ";ERL:END
```

```
1040 ENDPROC
```

```
1050 DEFPROCinit:DIMgold%(4),goldpos
%(4,2),xpos%(2),ypos%(2),HIX(5),HI$(5
):FORcol%=2TO5:HI$(col%)="DBT":HIX(co
l%)=1000:NEXT:HI$(1)="DEREKDBT":HIX(
1)=10000
```

```
1060 VDU23,224,96,176,96,32,48,120,8
8,24,23,225,0,64,0,0,0,0,0,23,226,0
,0,0,0,0,166,227,23,227,48,48,112,9
6,96,96,96,224,23,228,64,8,12,6,3,1,1
,0,23,229,14,31,31,14,0,0,0,8,23,230,
0,0,0,0,4,12,14,0,23,231,0,0,0,0,3,
1,7
```

```
1070 VDU23,232,0,0,0,0,0,240,16,23
,233,14,26,50,34,34,34,230,23,234,
6,13,6,4,12,30,26,24,23,235,0,2,0,0,
0,0,0,23,236,0,0,0,0,0,101,199,23,
237,12,12,14,6,6,6,6,7,23,238,2,16,48
,96,192,128,128,0,23,239,112,248,248,
112,0,0,0,16
```

```
1080 VDU23,240,0,0,0,0,32,48,112,0,2
3,241,0,0,0,0,192,128,224,23,242,0,
0,0,0,0,15,8,23,243,112,88,76,68,68
,68,68,103,23,244,62,127,0,0,8,28,2
8,23,245,0,0,42,62,28,0,0,0,23,246,0,
0,0,0,0,0,99,23,247,28,8,28,20,20,2
0,20,54
```

```
1090 VDU23,248,65,119,0,0,0,0,0,23
,249,28,62,42,62,28,0,0,0,23,250,255,
255,255,255,255,255,255,23,251,28
,20,28,0,0,0,0,0,23,252,0,8,0,0,0,0,
0,23,253,65,99,0,0,0,0,0,23,254,0,
0,0,20,20,20,20,54,23,255,0,0,20,0,0,
8,28,28
```

```
1100 ENVELOPE1,129,-15,-8,-3,10,10,1
0,126,0,0,-126,126,126:ENVELOPE2,1,0,
0,0,0,0,126,-1,0,-3,126,126:ENVELOP
E3,1,4,-4,4,2,4,2,127,0,0,-5,126,126:
ENVELOPE4,1,-1,0,0,145,0,0,10,0,0,-10
,10,0:ENVELOPE5,3,-1,0,0,150,0,0,10,0
,0,-10,10,0:ENDPROC
```

*This listing is included in this month's cassette tape offer. See order form on Page 193.*



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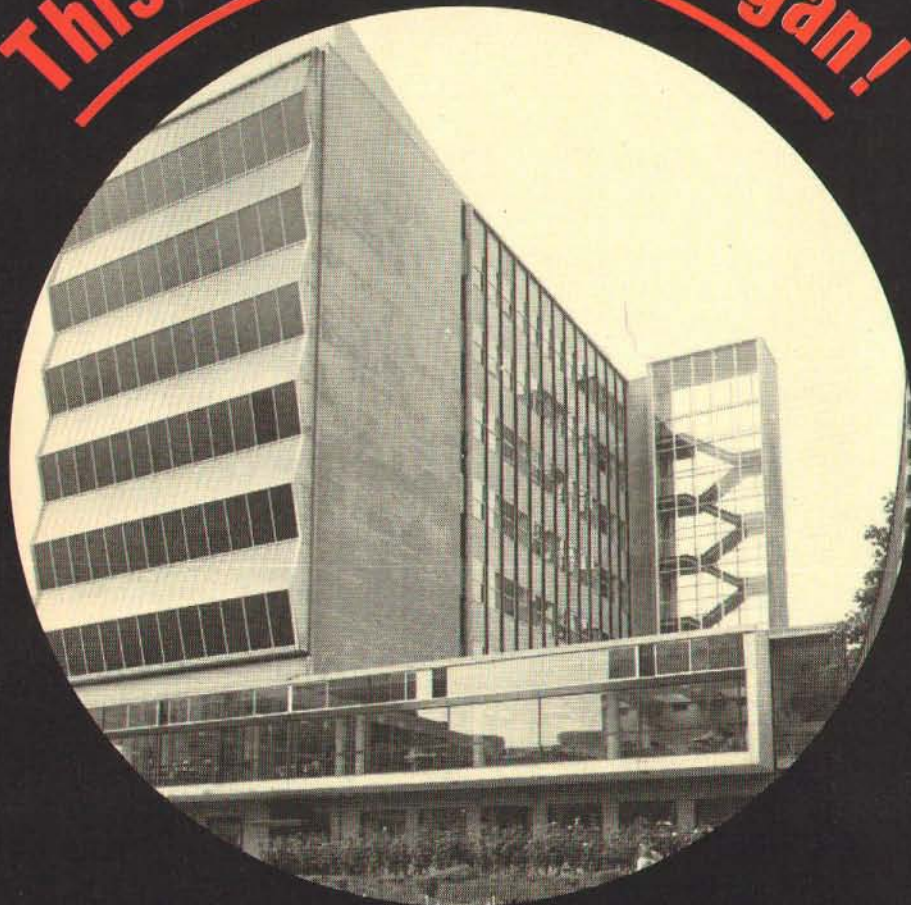
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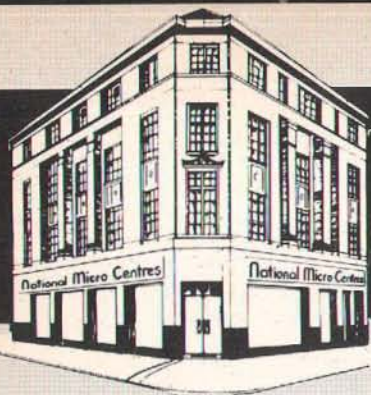
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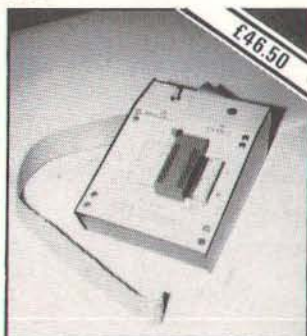
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4. Program eprom from memory.
5. Verify byte by byte and compute checksum.
6. allow buffer start area to be changed.
7. All operating system calls may be used when in menu mode.
8. Semi-intelligent programming. Typical time to program a 2764 8k device is approx. 50 sec. depending on the data to be programmed.
9. Additional software supplied to enable your own program (basic or machine code) to be put into eprom with the necessary leader information to allow calling with a \*command. Downshift routine to enable basic programs to be run is also supplied.

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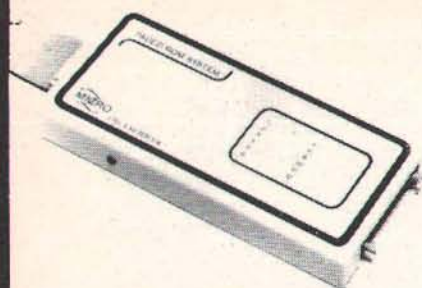
# Micro Term listing

## From Page 117

940 .check_for_e	1400 PLA	1890 .check_xon_x	2380 LDA #inputbu	ck DIV 256
nd	1410 BNE on	off	ffer MOD 256	2740 LDA operand
950 LDA buffpoin	1420 .off	1900 JSR getchar	2390 STA filebloc	2750 PHA
tl	1430 LDA bufferof	1910 BCS endcheck	k	2760 JSR OSFILE
960 CMP bufftopl	f,Y	1920 .char_receiv	2400 STA paramblo	2770 PLA
970 LDA buffpoin	1440 JSR OSASCI	ed	ck	2780 BEQ out
th	1450 INY	1930 CMP #17	2410 LDA #inputbu	2790 LDA buffstar
980 SBC bufftoph	1460 CMP #13	1940 BNE xoff	ffer DIV 256	tl
990 RTS	1470 BNE off	1950 LDX #0	2420 STA filebloc	2800 CLC
1000 .storechar	1480 SEC	1960 STX xon_xoff	k+1	2810 ADC filebloc
1010 LDY #0	1490 RTS	_status	ck+1	k+10
1020 STA (bufftop	1500 .on	1970 .xoff	2440 LDA #18	2820 STA bufftopl
l),Y	1510 LDA bufferon	1980 CMP #19	2450 STA paramblo	2830 LDA buffstar
1030 JSR incremen	,Y	1990 BNE nocode	ck+2	th
t_store	1520 JSR OSASCI	2000 LDX #1	2460 LDA #32	2840 ADC filebloc
1040 RTS	1530 INY	2010 STX xon_xoff	2470 STA paramblo	k+11
1050 .fetchchar	1540 CMP #13	_status	ck+3	2850 STA bufftoph
1060 LDY #0	1550 BNE on	2020 .nocode	2480 LDA #127	2860.out
1070 LDA (buffpoi	1560 SEC	2030 JSR display	2490 STA paramblo	2870 RTS
ntl),Y	1570 RTS	2040 .endcheck	ck+4	2880 .inputbuffer
1080 PHA	1580 .fkey1 \ out	2050 LDX xon_xoff	2500 LDX #parambl	2890 ]
1090 JSR incremen	put buffer	_status	ock MOD 256	2900 PZ=PZ+20
t_pointer	1590 JSR send_buf	2060 BNE check_xo	2510 LDY #parambl	2910 [OPT opt%
1100 PLA	fer	n_xoff	ock DIV 256	2920 .fileblock
1110 RTS	1600 SEC	2070 JSR toRS423	2520 LDA #0	2930 ]
1120 .keyboard_sc	1610 RTS	2080 JMP output_l	2530 JSR OSWORD	2940 PZ=PZ+20
an	1620 .fkey2	oop	2540 .zeroblock	2950 [OPT opt%
1130 LDA #145	1630 LDA #0	2090 .allsent	2550 LDY #2	2960 .paramblock
1140 LDX #0	1640 STA operand	2100 RTS	2560 LDA #0	2970 ]
1150 LDY #0	1650 JMP filing	2110 .toRS423	2570 .zeroloop	2980 PZ=PZ+6
1160 JSR OSBYTE	1660 .fkey3	2120 LDA #3	2580 STA filebloc	2990 [OPT opt%
1170 BCS nokey	1670 LDA #&FF	2130 LDX #7	k,Y	3000 .filename
1180 TYA	1680 STA operand	2140 JSR OSBYTE	2590 INY	3010 ]
1190 CMP #128	1690 .filing	2150 RTS	2600 CPY #&12	3020 \$PZ="Filenam
1200 BCC not_fkey	1700 JSR fileop	2160 .toscreen	2610 BCC zeroloop	e ?"
1210 BEQ fkey0	1710 LDA #7	2170 LDA #3	2620 LDA buffstar	3030 PZ=PZ+LEN(\$P
1220 CMP #129	1720 JSR OSWRCH	2180 LDX #4	tl	Z)+1
1230 BEQ fkey1	1730 SEC	2190 JSR OSBYTE	2630 STA filebloc	3040[OPT opt%
1240 CMP #130	1740 RTS	2200 RTS	k+2	3050 .bufferon
1250 BEQ fkey2	1750 .nokey	2210 .display	k+10	3060 ]
1260 CMP #131	1760 SEC	2220 PHA	2640 STA filebloc	3070 \$PZ="Buffer
1270 BEQ fkey3	1770 RTS	2230 JSR toscreen	2650 LDA buffstar	On"
1280 SEC	1780 .send_buffer	2240 PLA	th	3080 PZ=PZ+LEN(\$P
1290 RTS	1790 JSR toRS423	2250 JSR OSWRCH	k+3	Z)+1
1300 .not_fkey	1800 LDA buffstar	2260 RTS	k+11	3090 [OPT opt%
1310 CLC	tl	2270 .fileop	2660 STA filebloc	3100 .bufferoff
1320 RTS	1810 STA buffpoin	2280 JSR toscreen	k+14	3110 ]
1330 .fkey0 \ toq	tl	2290 LDA #12	2700 LDA bufftoph	3120 \$PZ="Buffer
gle copy to buffer	1820 LDA buffstar	2300 JSR OSWRCH	2710 STA filebloc	Off"
1340 LDA buffer_f	th	2310 LDY #0	ck MOD 256	3130 PZ=PZ+LEN(\$P
lag	1830 STA buffpoin	2320 .prompt	2720 LDX #fileblo	Z)+1
1350 EOR #1	th	2330 LDA filename	k+15	3140 NEXT opt%
1360 STA buffer_f	1840 .output_loop	,Y	2730 LDY #fileblo	3150 END
lag	1850 JSR wait	2340 JSR OSASCI		
1370 PHA	1860 JSRfetchchar	2350 INY		
1380 JSR toscreen	1870 BCS alisent	2360 CMP #13		
1390 LDY #0	1880 JSR OSWRCH	2370 BNE prompt		

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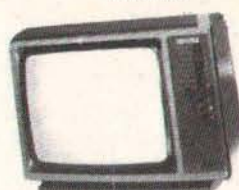
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## Teletext listing

### From Page 59

```

460 VDU 23,230,0,8,28,42,8,8,8
    ,0
470 VDU 23,231,0,0,0,127,0,0,0
    ,0
480 VDU 23,232,64,64,64,66,70,10
    ,30,2
490 VDU 23,233,20,20,20,20,20,20
    ,20,0
500 VDU 23,234,96,16,96,18,102
    ,10,30,2
510 VDU 23,235,0,8,0,127,0,8,0
    ,0
520 VDU 23,236,0,252,252,252,252
    ,252,252,0
530 PROCassem
540 ENDPROC
550
560 DEF PROCsetline
570 IF Y%>setline+1 OR top=FALSE
    THEN top=TRUE
    :bottom=FALSE
    :setline=Y%
580 IF Y%=setline+1 AND top=
    TRUE
    THEN top=FALSE
    :bottom=TRUE
590 ENDPROC
600
610 DEF PROCgraph(c%)
620 LOCAL L1,L3,L4,L5,L6,L8,s%
630 IF c%=96
    THEN c%=35
    ELSE IF c%=95
        THEN c%=96
640 c%=(c%AND &7F)-32
650 IF c%>=64
    THEN L6=&F
    :c%=c%-64
660 IF c%>=16
    THEN L6=L6+&F0
    :c%=c%-16
670 L8=L6
680 IF c%>=8
    THEN L4=&F
    :c%=c%-8
690 IF c%>=4
    THEN L4=L4+&F0
    :c%=c%-4
700 L5=L4
710 IF c%>=2
    THEN L1=&F
    :c%=c%-2
720 IF c%=1
    THEN L1=L1+&F0
730 L3=L1
740 IF separate=TRUE
    THEN L3=0
    :L5=0
    :L8=0
    :L1=L1 AND &EE
    :L4=L4 AND &EE
    :L6=L6 AND &EE
750 VDU 23,226,L1,L1,L3,L4,L5,L6
    ,L6,L8
760 s%=&C10
770 PROCoutput(s%)
780 ENDPROC
790
800 DEF PROCdiff(c%)
810 c%=c%AND &7F
820 c%=c%-90
    :IF c%>5
        THEN c%=c%-27
    :IF c%>10
        THEN c%=10
830 s%=(&C10+c%*8)
840 PROCoutput(s%)
850 ENDPROC
860
870 DEF PROCprint(c%)
880 c%=c%AND &7F
890 s%=b%+(c%-32)*8
900 PROCoutput(s%)
910 ENDPROC
920
930 DEF PROCexpand(s%)
940 IF bottom=TRUE
    THEN s%=s%+4
950 FOR K%=0 TO 3
    :K%?(m%+K%)=K%?s%
    :K%?(m%+1+K%)=K%?s%
    :NEXT
960 ENDPROC
970
980 DEF PROCoutput(s%)
990 IF double=TRUE
    THEN PROCexpand(s%)
    :s%=&C08
1000 !&80=s%
1010 !&82=p%
1020 CALL &C90
1030 FOR L%=0 TO 7
    :VDU 1,L%?&C00
    :NEXT
1040 ENDPROC
1050
1060 DEF PROCassem
1070 code%=&C90
1080 source=&80
1090 dest=&82
1100 loc=&84
1110 bit=&85
1120 put=&86
1130 off=&87
1140 table=&88
1150 FOR pass=0 TO 2 STEP 2
    1160 P%<code%
    1170 [OPT pass
    1180 LDY#7
    1190 LDA#0
    1200 .clear STA (dest),Y
    1210 DEY
    1220 BPL clear
    1230 LDX#8
    1240 LDA#128
    1250 .init STA table-1,X
    1260 LSR A
    1270 DEX
    1280 BNE init
    1290 LDA#&FF
    1300 STA off
    1310 LDA#7
    1320 STA loc
    1330 .outer
    1340 LDA#7
    1350 STA bit
    1360 LDA#&FF
    1370 STA put
    1380 INC off
    1390 .inner
    1400 INC put
    1410 LDY loc
    1420 LDX bit
    1430 LDA (source),Y
    1440 AND table,X
    1450 BEQ next
    1460 LDX off
    1470 LDA table,X
    1480 LDY put
    1490 OR A (dest),Y
    1500 STA (dest),Y
    1510 .next DEC bit
    1520 LDA bit
    1530 BPL inner
    1540 DEC loc
    1550 LDA loc
    1560 BPL outer
    1570 RTS
    1580 J
    1590 NEXT
    1600 ENDPROC
    1610
    1620 DEF PROCload
    1630 CLS
    1640 INPUT ""Dump which file "
        ,file$
    1650 $cmd%="LOAD "+file$+" 7C00"
    1660 X%<cmd%
        :Y%<cmd%DIV 256
    1670 CALL &FFF7
    1680 ENDPROC

```

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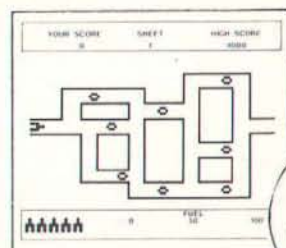
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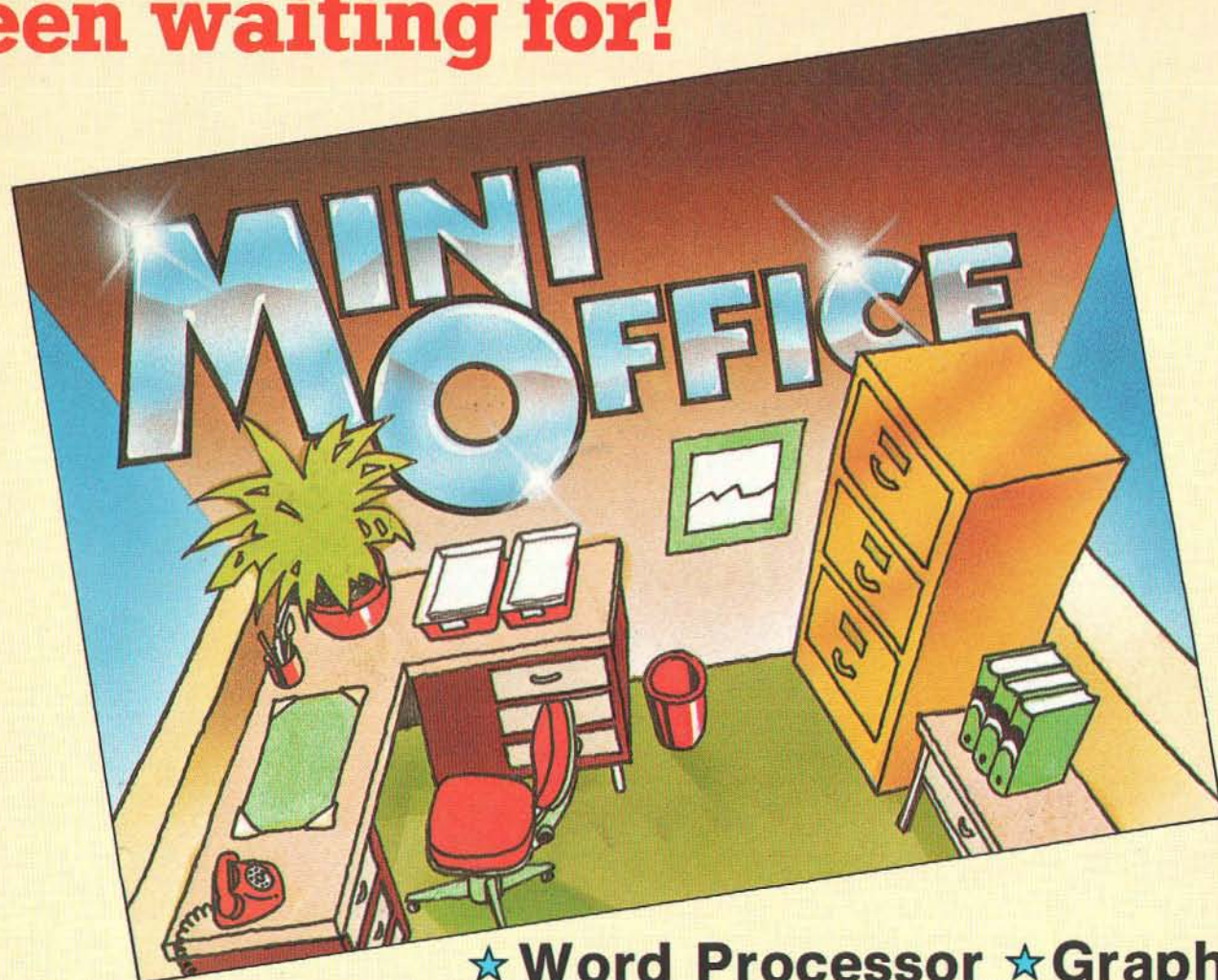
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# MICROMAIL

## Improved performance of &7F OSWORD

I WAS very interested to read details of the &7F OSWORD call to the DFS, in the article by Miles Gooby in your June 1984 issue.

Having found that the performance of disc transfers from Basic is well below that which should be possible, I hoped that this was a solution.

Unfortunately it wasn't, but I have discovered why the performance is so low. Even better, I have found a method of improving the performance of the &7F OSWORD in many circumstances. (This applies to DFS 0.90).

If you time &7F calls, you find that any action takes about half a second, regardless of circumstance. For example, to read one sector (averaged over many tries, without seeking) takes 460 milliseconds.

Even more ludicrous, the read drive status command (&67, no parameters) takes 400 msec, and this is a purely electronic operation!

As stated in the article, multisector operations are more efficient, and the time increases only a little for each additional sector.

Clearly each DFS call is imposing an overhead of about 400 msec, and that is a lot of code.

After digging about in the DFS, I found that on each call the drive and head are selected,

and the DFS loops until the drive becomes ready.

Now "ready" depends on a circuit (ICs 83, 84, 85) which sets a delay of .25 sec and then waits until the index hole passes by.

This allows the motor to come to speed, and the drive remains ready so long as the disc is rotating.

Fine if the drive was stopped when you called the DFS. But this circuit, and the delay loop, is triggered for every DFS call, even if the disc is still running on from the previous transfer.

The correct logic would be not to do the select if the drive number were unchanged and the drive was still ready.

Now the good news. If you set the drive number in an fcb to a negative value (that is 128 to 255), then all this code is bypassed and the previously selected drive is used.

Thus the drive number need only be set if it is the first access to the drive or after any action which might access another drive or the drive might have stopped.

Actually the last case is easy to deal with, because you get the error &10, "Drive Not Ready", — so retry with the drive number

set. The gains can be well worth while.

If you alter the verify code to set the drive only on the first transfer, it runs three times faster.

I was interested in searching files for the presence of character strings (with only a single sector buffer available).

This reduced immediately from 460 msec per sector to 220 msec average. However for specific applications like this it was worth formatting the disc with an interleave factor. Then the time reduced to 62 msec per sector, more than seven times faster.

Interleaving is a method of formatting the disc with the sectors out of order. For example, if sectors are formatted in the order 0741852963 instead of 0123456789, there are 2 sectors interleaved between every successive pair.

The idea is that your program can read a sector, do some work on it, and come back for the next one just as it is approaching the head.

The 8271 is quite happy to find the sectors out of order. The interleave factor must be tuned to the application.

Multisector operations, and hence LOADs and SAVEs, will actually be slower.

I would be interested to hear if other DFSs have cured the problem, and more especially if Acorn have changed later DFS issues. Would you want a CP/M system which took nearly half a second per sector?

Finally, one small point in the toolkit routines. Line 2150 should be:

```
2150 ROR A: AND # 1
```

The head number is 1 for drives 2 and 3 on double-sided drives. This has no effect on the BBC Micro itself, but the discs might be unreadable on a machine using a different disc controller. — G.M. Dougan, East Linton, East Lothian.

## Down the Tube?

WHILE generally agreeing with Alan Plume's enthusiastic review of the 6502 second processor and the Bitstik I feel he has underplayed the drawbacks and annoyances of the systems.

Potential users must be prepared to find the great majority of popular firmware, such as Wordwise, not working when the second processor is powered up.

Turning the mains on and off is inelegant. Why didn't Acorn create an FX call to enable/disable the processor?

While obviously many software houses will blame Acorn, most of the problems appear to be caused by non-conformance to Acorn's published rules.

No doubt software houses will be able to have a second bite at the cherry by selling second processor compatible

## Something good from Nuneaton

THANK you for printing Mr Flanagan's letter on getting inverted commas to PRINT in the June 1984 of The Micro User.

I have for some time been worrying my head over this, as I have written an analysis program for my husband's business and wanted to be able to call up a particular file of ongoing information, from within the program, for whichever consultant the program was being run.

Now, having obtained the consultant's name at the beginning of the program (A\$), the insertion of the lines shown right has resolved my dilemma.

I hope you approve of this letter written on a BBC B with Wordwise and an Olympia electronic compact typewriter — a system I have found most satisfactory. — Ruth Samways, Plymouth.

P.S. I always knew something good would come out of

```
90 IF A$ = "KEITH SAMWAY  
S" THEN D$ = ""DATAS""  
100 IF A$ = "FRED BLOGGS"  
THEN D$ = ""DATAB""  
110 IF A$ = "MARY JONES"  
THEN D$ = ""DATAJ""  
200 D=OPENUP D$  
210 PRINT#D,W,WW :REM etc  
etc etc  
220 CLOSE#D
```

Nuneaton, whatever Terry Wogan says!



# MICROMAIL

## From Page 177

upgrades of existing products.

As regards I/O, the Bitstik lacks an input digitiser but more importantly the highest resolution hardcopy output from the system is limited to a Mode 1 screen dump.

Thus the fine detail of drawings cannot be realised in spite of the infinite resolution claimed for the system. The original Apple Bitstik had a plotter driver, so why not the Acorn one?

On the plus side, the new Acorn DFS is a great improvement on the old one and does not hang up while printing/reading/editing long files.

View, although slightly unstable in scrolling at times, is superb in the system.

BCPL recognises the spare memory and a "high" version isn't necessary. To my surprise Watford's 1.3 DFS appears to work in the system, although my tests have not been very extensive.

Bitstik's precision drafting capability is a joy to work with and circuit diagrams are a doddle once a symbol library has been created.

Users just requiring extra memory for word(wise) processing should also seriously consider the alternative packages of Aries-B20 RAM expansion with Wordwise-B20 or the more expensive and versatile Solidisk system. — M.J. Maytum, Bedford.

## Microweb standard

CAN I enter a plea on behalf of all users of Acorn's Prestel adaptor for Microweb to switch from the communications standard it currently uses to that of Prestel, V23 Mode2.

I have tried to contact Microweb with the Prestel adaptor without any success at all. I note from your recent issues that you have been advocating the multi-mode Nightingale modem.

If you were to make the

suggested change, then all users of the standard Acorn equipment would be able to talk to Microweb plus all the other Grapevine users, since they would be able to switch their modems to V23 with no problems.

I received my Prestel adaptor only last week, after having had it on order for many months. Since advance literature was not available I had to take pot luck that the unit would allow access to non-Prestel systems.

It does not (apart from BT Gold), and so may I warn prospective purchasers of this unit that if they want anything besides Prestel, then they will need a multi-mode unit, like the Nightingale.

Another useful piece of information prospective purchasers might like to have is that, contrary to preliminary information in the BBC Micro User Guide to the effect that the Prestel unit would use the 1MHz bus, it does not. It uses the RS423 socket, which will be a pest for anyone using a serial printer.

That said, I have no doubt that the Acorn unit is very good for its main stated purpose, to link to Prestel. I hope to verify this when my user i.d. and password are sent to me.

Meanwhile could Micro User please consider the above suggestion? I suspect many people will buy the Acorn unit, partly for the name, and also because it is cheaper than multi-mode units, hence with V23 Microweb will not cast the non-Nightingale users into outer

darkness, as it does at present. — R.D. Wright, Guildford, Surrey.

● Microweb is very much an interactive communications medium — we want people to talk to us as much as we want them to hear what we've got to say.

In order to do this we listen and talk at the same speed — 300 baud. We can't go faster for technical reasons.

However Prestel doesn't expect much user response and can share out the speeds differently, using 1200 baud when it talks, and only 75 when it listens.

Both systems have their advantages. While at the moment Microweb is staying at 300 baud, we are strongly considering adding facilities for Prestel type modems. In fact, all we want to be sure of is the demand, so if you want a 1200/75 baud Microweb, write in and tell us.

We would still recommend a modem with multiple baud rates. Considering their extra power, they cost very little more.

## Eprom copying

IN a recent advertisement Solidisk claim to have sold 10,000 units. Even assuming this to be a slight exaggeration, there are quite a few Solidisks around and now with the 256k upgrade on offer this will no doubt encourage further sales.

The system lends itself to eprom copying. We all know there is no such thing as com-

plete software protection. However there is a trade off to be made — the effort expended to break the protection, or find someone with the eprom you need, the gratuity paid to let you copy it, photocopying the manual. All this against the cost of the legal purchase.

While a few folk will delight in the challenge of breaking the protection, most just want the software and are willing to pay. But who wants to purchase an eprom to offload it at once?

Software suppliers do nothing to cater for this market, they just complain about piracy.

Why not offer Solidisk owners the eprom programs on tape? The cost should reflect the saving of eproms and create another outlet.

The majority of micro users do not begrudge the programmer his pound of flesh, but they don't want to part with the whole sheep. Will any software house give a lead? — R.D. Esson, Wembley, Middlesex.

● Interesting point. So far we've only heard of one company offering their products at a lower price for Solidisk users. Perhaps it will catch on.

## Need for a DFS ROM

IF a disc interface is fitted, is there any need for a DFS ROM? If so, what does the ROM do?

This leads to a second point. Where exactly, is the ROM

## No Olympic joysticks

I RECENTLY bought Micro Olympics. I find it an exceptionally good program, with good, smooth graphics, and good sound effects.

The computer also puts up a good challenge and so far I can only beat it at hammer, discus and occasionally high jump and 100m.

However, I found one slight point which I think could improve the game and perhaps save

wear on the keys, and that would be an option to use joysticks.

I would be very grateful if it would be possible to produce a joystick version which I would be able to exchange for my present one. — Tom Lewis, St Erth, Cornwall.

● Whereas all keyboards are standard, all joysticks are not — we only wish they were. It would be impossible to write a

program to cater for all the variations and sensitivity in all available joysticks.

Apart from this fact, backward and forward movement of the joystick lever at the rate needed would cripple it, and the buttons on a double fire button stick are not sensitive enough.

Sorry, your fingers are just going to have to get stronger and stronger.



socket? I am puzzled by this as the User Guide says the ROM socket is on the left hand side of the keyboard.

In The Micro User I have read articles and adverts about internal ROMs. This contradicts what is said in the User Guide. I thought ROMs are large cartridges that plug into the socket mentioned in the User Guide. — Kevin Lomax, Bolton, Lancs.

● Second point first. There are lots of ROMs on the BBC Micro.

The ROM socket mentioned on the left hand side of the keyboard is supposed to go in place of the perforated plastic rectangle there.

The socket is meant by Acorn to take ROMs containing additional vocabulary for your speech synthesis chip, or alternatively cartridge type programs on ROM. Other firms are now using the "ashtray" to fit a ROM extension socket, allowing you to change ROMs without removing the micro's lid.

Then there are the amazing sideways ROMs hidden away under the keyboard. You have to dismantle the micro to get at these. They are Acorn's master touch, giving the BBC Micro incredible power by allowing you instantly to turn the micro into a word processor, communications terminal, machine code development system and so on and so on. Not only that, the chips can share jobs out with each other!

Now one of these ROMs is the DFS chip, which like the other chips, is a clever kind of program. This allows the BBC Micro to make use of discs. However it needs quite a few other chips and sockets to do this. The whole ensemble is called the disc interface.

## Better pilot now

I ENJOYED the game Space Pilot in the June 1983 Micro User, but was disappointed to discover that the program Joykeys (October 1983) did not

work as negative Inkeys are used to detect key closure, so I did it myself.

Change line numbers 120, 160, 170, 180, 190, 890 and 900 to the following:

```
120PROC: IF (ADVAL(0) AND
3) =1 AND LZ>8 PROCB
160DEFPROC(RQZ): IF ADVAL
(2) DIV256<80 YZ=YZ-RQZ*(20/
WZ)
170IF ADVAL(2) DIV256>180
YZ=YZ+RQZ*(20/WZ)
180IF ADVAL(1) DIV256<80X
Z=XZ+RQZ*(30/WZ)
190IF ADVAL(1) DIV256>180
XZ=XZ-RQZ*(30/WZ)
890IF ADVAL(1) DIV256<80D
RX=DRX+2 ELSEIF ADVAL(1) DI
V256>160 DRX=DRX-2
900IF (ADVAL(0) AND 3)=1 DR
1X=DR1X+2: MOVEXX,YZ:VDU226:
PROCF0:6COL4,0: SOUND0,-5,4,
1:MOVEXX,YZ:VDU226: IF F<B E
NDPROC
```

It's a good game now! — Richard Deakin, 51 Kalmia Way, Forrestfield, Western Australia.

## Bye-ter bitten

I DON'T know whether Mr Bye (Micromail, May 1984) will be relieved or disappointed to find that I am not a schoolmaster and have no wish to give him "six of the best" for his views. (I would reserve punishment for the editors, and contributors, who publish programs which cannot possibly work!)

If we are to follow the school analogy though, I would give him a B—for not thinking things through properly.

He is absolutely right in thinking that merely replacing GOSUB with PROC will not produce a properly structured program. The program on Page 63 of the May issue, which has obviously been converted from another version of Basic with

only the changing of GOSUBs, provides an excellent counter-example.

You can still see the gap in the main program to allow the GOSUBs to have the early line numbers.

The real problem is that the division into modules, whether procedures or functions, comes at the design stage, not when we are writing the actual Basic statements.

If the design has been done properly the procedures will fall out naturally, without any need to put them in specially.

It is, in fact, a much more natural way of thinking about a problem. If we are telling someone else we say "If this is true then do that" not GOTO.

Perhaps one of the biggest problems for hobby programmers is that most of us do not design programs at all; we get our pleasure from writing the Basic code.

This lack of design often leads to over-complicated programs which are difficult to amend or debug. If programs are properly structured amendments are relatively easy, and confined to well-defined parts of the program.

Printing mailing labels is, for instance, a self-contained task and, if the job is contained in PROCprintlabels, it is not difficult to change the program if the size of label changes.

If we mix the printing in with the selection of labels to be printed we will probably need more changes and the whole of the program will need retesting.

If we use functions and procedures with the minimum of contact with the rest of the program, by using parameters and local variables, we can gain a further advantage.

We can, in effect, extend Basic by storing standard tested code for use in many programs with no change except for renumbering.

I now have a collection of standard modules for such things as validated input, reading the real time clock and drawing circles.

When I bought the graphics

ROM I was able to amend my circle procedure and know that the program remained correct.

I cannot think of any time when a GOSUB gives an advantage over a procedure, and repeated use of procedures is quicker than GOSUBs, for which Basic has to search every time they are used.

GOTO and GOSUB are provided in the language but their proper use is, surely, to allow us to convert programs not designed by ourselves from other computers. — David H. Wild, Hemel Hempstead.

## Sydney user group

WE would be grateful if you would inform your readers that a new user group is to be set up in Sydney, Australia, and advise any interested persons to make contact at the Sydney BBC Microcomputer User Group, c/o Mr Stuart McCann, 500 Miller Street, Cammeray, N.S.W. 2062, Australia. Tel: Sydney 923 1137. — R. Stuart-Harris, Killara, NSW.

## Speedier micro

I HAVE discovered a method of speeding up the already fast Beeb. Type:

```
?&FE45=255
```

and:

```
?&FE46=255
```

This accesses the timers for the system VIA causing the computer to virtually ignore the keyboard and concentrate on executing the program.

This increases the time for a FOR%—1 TO 10000 loop from 7.5 seconds to 0.3 seconds.

This is ideal for a program where a large amount of processing is involved but if any input is required it will need to be reset to a more normal value.

Type:

```
?&FE45=14
```

```
?&FE46=12
```

These values may vary



# MICROMAIL

```

10 REM Prime number gene
rator
20 REM (c) B.Daulton
30 MODE7
40 VDU23;8202;0;0;0;
50 PRINTTAB(10,5);CHR$14
1;CHR$130;"PRIME NUMBERS"
60 PRINTTAB(10,6);CHR$14
1;CHR$130;"PRIME NUMBERS"
70 PRINTTAB(3,10);CHR$13
1;"This program generates p
rime"
80 PRINTTAB(3,12);CHR$13
1;"numbers in the range 1 t
o 17160"
90 PRINTTAB(4,20)"Press
the space bar to continue"
100 Z$=GET$:IF Z$<>" " TH
EN 170
110CLS:PRINTTAB(5,5);CHR$
134;"You will be asked to s
pecify the"
120 PRINTTAB(3,7);CHR$134
"first and last numbers."
130 PRINTTAB(4,9);CHR$130
"To show all primes in the
specified"
140 PRINTTAB(3,11);CHR$13
0"range you should not spec
ify a range"
150 PRINTTAB(3,13);CHR$13
0"of more than 700"
160 PRINTTAB(5,20);"Press
the space bar to continue"
170 Z$=GET$:IF Z$<>" " TH
EN 170
180 DVID=&70;DVIS=&72;DVI
DCH=&73;DVISCH=&75
190 NUM=&76;FIRST=&77;LAS
T=&79;Count=&78;OSWRCH=&FFE
E
200 FOR PASS = 0 TO 2 STE
P 2:PZ=&900
210 LOPT PASS
220 .BEGIN
230 LDY DVISCH
240 LDA FIRST:CMP #1:BNE
Continue
250 LDA #3:STA DVIDCH:LDA
#2:STA FIRST:JMP Next
260 .Continue
270 CMP #2:BEQ Next
280 CMP #3:BNE PDIV
290 .Next
300 LDX #7:LDA #9
310 .Space
320 JSR OSWRCH:DEX:BNE Sp
ace
330 LDA FIRST:ADC #48:JSR
OSWRCH
340 CMP #50:BNE PDIV
350 INC FIRST:JMP Next
360 .PDIV
370 LDA NUM:STA DVIS:LDA
DVIDCH:STA DVID:LDA DVIDCH+
1:STA DVID+1
380 LDX #16:LDA #0
390 .LOOP
400 ASL DVID:ROL DVID+1:R
OL A
410 CMP DVIS:BCC OVER
420 SBC DVIS
430 .OVER
440 DEX:BNE LOOP
450 CMP #0:BEQ NEXNUM
460 INC NUM:INC NUM
470 LDA DVISCH:CMP NUM:BM
I PRIME
480 JMP PDIV
490 .NEXNUM
500 INC DVIDCH:INC DVIDCH
510 LDA #1:CMP DVIDCH:BNE
GOON
520 INC DVIDCH+1
530 .GOON
540 LDA DVIDCH:SEC:SBC LA
ST:LDA DVIDCH+1:SBC LAST+1:
BPL FINISH
550 DEY:BNE AFTER
560 INC DVISCH:LDY DVISCH
570 .AFTER
580 LDA #3:STA NUM:JMP PD
IV
590 .PRIME
600 LDA DVIDCH:STA DVID:L
DA DVIDCH+1:STA DVID+1
610 .CONVERT
620 LDX #16:LDA #0
630 .LOOP1
640 ASL DVID:ROL DVID+1:R
OL A
650 CMP #10:BCC LESS1
660 SBC #10:INC DVID
670 .LESS1
680 DEX:BNE LOOP1
690 CLC:ADC #48
700 PHA:INC Count
710 LDA DVID:ORA DVID+1:B
NE CONVERT
720 LDA #9:SBC Count:TAX
730 .SPACE
740 LDA #9:JSR OSWRCH
750 DEX:BNE SPACE
760 .DISPLAY
770 PLA:JSR OSWRCH
780 DEC Count:BNE DISPLAY
790 JMP NEXNUM
800 .FINISH
810 LDA #10:JSR OSWRCH:JS
R OSWRCH:JSR OSWRCH:JSR OSW
RCH
820 RTS
830 ]
840 NEXT PASS
850 MODE1
860 VDU23;8202;0;0;0;
870 COLOUR2:INPUT TAB(1,1
0)"Range required.(First,La
st)",a,b
880 IF a<1 OR a>17160 OR
B<a OR B>17160 THEN 850
890 IF a DIV 2= a/2 THEN
A= a+1 ELSE A=a
900 CLS: TIME=0
910 PRINT TAB(5,2)"PRIME
numbers between ";a;" & ";B
920 PRINT
930 !DVIDCH=A: ?DVISCH=IN
T(SQR(A))+1: ?NUM=3: !FIRST=a
: !LAST= B
940 CALL BEGIN
950 PRINTTAB(8,28);"Time
taken = ";TIME/100;" secs"
960PRINTTAB(6,30);"PRESS
SPACE BAR TO CONTINUE"
970 Z$=GET$
980 IF Z$= " " GOTO850 EL
SE 980

```

## From Page 179

slightly depending on what the computer is doing.

By inputting low values the computer will concentrate on the keyboard and output will be very slow. This enables you to see how the computer forms its characters.

Other strange effects may be seen. Play a Mode 2 game and in the middle of your game press Break. Type:

?&FE45=1

?&FE46=0

MODE 2

The screen that you were just playing will reappear and slowly clear. — I.A. Padgett, Tewksbury, Glos.

## Last of the primes

FURTHER to my recent letter on the subject of generating prime numbers, I have now solved the problem of printing decimal numbers from the machine code program and enclose a copy of my finalised program (left).

Primes from 1 to 500 are produced in 0.57 seconds while the longest time taken over any sequence of 500 numbers (up to 17,000) is about 1.35 seconds.

The first and last numbers input may be odd or even. — B. Daulton, Lincoln.

● This correspondence is now at an end — please! Editor.

## Problem cracked

REGARDING G. Black's letter in the June Micromail concerning keyboard costs . . .

I too suffered an intermittent keyboard fault. It was not the cost of repairs that daunted me, but the time it took — six weeks.

So armed with a soldering iron, an ohm meter and a magnifying glass I set forth. It soon became apparent that several



hairline cracks were present on the printed circuit board under the keys.

These were easily bridged, and no similar further problems have occurred. — A. Moulder, Rainham, Essex.

## Good value

MR TAYLOR (Micromail June 1984, page 182) complains of the high cost of disc based software. He quotes a price of £1 for bulk purchases of discs.

While I am sure that discs can be bought for such a sum, all the discs used by Dataware cost in the order of £3 each and are covered by a manufacturer's 5 year guarantee — this contrasts

with perhaps 40 pence for a tape.

Additionally our disc software utilises the superior facilities of the disc filing system and contains more data than the tape. We have never had a faulty disc returned — sufficient reason for not using cheap discs.

I trust that this puts things into perspective. — Les Peters, Dataware, Swindon.

## Dicey..

I AM trying to program a game called cricket where instead of a ball only two dice are used.

On one die the data is "1", "2", "3", "4", "5", "6", "OWZAT" which is for the batsman. For the bowler the data is "Stumped", "Not out", "Bowled", "No ball", "Caught", "Lbw".

I know how to print random numbers but can you tell me how to print random words? —

K. Howell, Northampton.

● We're not sure how you get seven things on one die. Casting our minds back, we reckon that '5' was missing on the first die.

Notwithstanding, if you know how to generate the random numbers required, simply use these numbers to index a subscripted variable. It sounds fancy, but Mike Bibby's beginners articles in the July and August 1984 issues make the ideas crystal clear.

In short, considering just the second die, make `die$(1)="stumped"` `die$(2)="Not out"` and so on. Then choose the one you mean to be `die$(RND(6))`.

This will give you random words.

## Memory fault

FIRST of all, add my name to your very long list (reached 'No room' yet?) of people who enjoy your magazine from the first to the last page.

When using the AUTO line numbering sometimes a white dot appears on the screen. When the line number 'lines' up with this dot (about 1-2 pixels) the numbering starts at 10 again. Any suggestions? (OS 1.20/DFS 0.90/BBC 100 drive).

In one of your articles it was claimed that \*TV0,1 hardly made a difference. This is true for normal TVs, but it makes quite a difference on TVs converted into monitors.

The User Guide states that

# If you want more from your MICRO



**UPGRADE**'ing your BBC micro (model "A" or "B") is the simplest, most cost effective way of dramatically improving its capabilities. An **UPGRADE** gives you access to the world's largest library of professional software and clears the way for future expansions by adding a Z80 A second processor 64K of additional RAM, and a flexible disk drive controller to your already powerful BBC micro. An **UPGRADE**'s ability to run TRUE CP/M rather than a CP/M compatible operating system is one of the features that make an **UPGRADE** the sensible choice. Couple this with its ability to handle disk drives independently from the BBC micro and your ability to choose what disk drives to use (3½", 5¼" or even 8") and you can see why an **UPGRADE** is the only choice.

Software available to run on your **UPGRADED** micro seems limitless. From wordprocessing to financial analysis for the professional user, to Pascal or Cobol for the serious programmer, all still capable of using the sound and graphics capabilities of the BBC micro. The choice does not end there though. An **UPGRADED** micro can be further expanded by adding up to three of our option boards to the unit. There are boards available for expanding the **UPGRADE**'s RAM, for providing further serial or parallel interfaces, additional disk interfaces for 5¼" or 8" disk drives. There is even a Winchester disk controller and an IEEE 488 interface option.

So if you **do** want more from your micro — **UPGRADE** it.

### SPECIFICATIONS

**Processor** — Z80 A running at 4MHz  
**Memory** — 64K RAM (fully expandable)  
**Operating system** — CP/M (Supplied on disk)  
**Other operating systems available** — TURBO DOS  
**Disk drives supported** — 3½", 5¼", 40 or 80 track double or single sided, single or double density. Can be shared with the BBC micro.

**NOTE:** An **UPGRADE** does not require the fitting of a DFS within the BBC micro.

**Disk drive capacities** will vary dependent on disk drives fitted (example 5¼" DD/DS gives 800K storage).

**Keyboard** — As BBC

**Graphics** — As BBC

**Power requirements** — 240V AC.

## PRICE: £299 + VAT

**UPGRADE TECHNOLOGY, 290A High Road, London NW10 2EU.**  
**Telephone 01-451 4416. Telex 46523. Symsys G.**

**DEALER ENQUIRIES  
INVITED**



# MICROMAIL

## From Page 181

END is optional, so why do I get 'No Proc' in:

```
10 N=0 : ENVELOPE 1,1,0,
0,0,0,0,0,10,-1,0,-1,126,1
20 REPEAT: N=N+2 : PROCS
OUND(N) : UNTIL N>80
30 REM .....END
40 DEFPROC SOUND(N)
50 SOUND 0,1,6,5 : T% = 1
NKEY(60-N)
60 ENDPROC
```

— K. Pigge, The Hague.

● Your problem with AUTO points to a definite memory fault

somewhere — or perhaps a ULA problem. Before taking it to a dealer though, why not take the lid off and press the chips down firmly. Often the only problem is the chips not seating properly.

END is optional only when you don't have to have it!

If you have procedures after the logical finish of the program and there's no END to stop it, the micro will just plough through into the first procedure (starting at line 40).

The important point to note is that it hasn't got there via a legitimate PROC call. When it encounters the ENDPROC at line 60, it hasn't come from a

PROC and so gives its plaintive 'No Proc' message.

## Merging

MANY people have been confused over the issue of merging programs, over \*SPOOL and the like.

There is a much more convenient method. If you want to merge the program in memory with one currently on tape, enter:

PRINT ~ (TOP-2)

We'll call the answer NNNN. Then:

\*LOAD"PROG" NNNN  
to load the second program,  
PROG.

When the program/s have loaded, you should find that although you can see both programs, each will use their normal line numbers.

To remedy this, type RENUMBER — and the programs should have merged. — Richard Browning, Bishops Lydeard.

● Your method is, in fact, shown on page 402 of the User Guide, but let's face it, that's a long way to plough through for it!

On disc we reckon the \*SPOOL method to be far the best, but for tape the method you describe is easier.

And finally, with tongue firmly in cheek . . .

## Looking for MacRo User!

Dear Deidre,

Sorry I haven't been in contact yet, but Bob's been driving me mad. I thought that bringing him away on holiday to Scotland would cure him of the obsession with his thing but, alas, no such luck.

It started before we'd even left. I'd forbidden him to bring his micro or any computer books — and especially THAT magazine, the one with that unpleasant Barry Tree. It was only when I accidentally overheard a phone call Bob was making that I realised what was wrong. I was so shocked that I dropped the glass.

He was calling that awful Mike Cook (you know, the one with the artistic way with diagrams) and trying to find out a way of interfacing his Beeb with the car's cigarette lighter. I soon put a stop to that.

The drive up wasn't all that easy. Bob just sat there in the passenger seat watching the odometer with glazed eyes. Every now and then he muttered "so that's how binary works" and gave a deep sigh.

As soon as we reached Fort William he was out of the car and into every newsagent's hunting for the latest issue of Micro User.

I've never been so embarrassed in my life. Apparently his nephew Nigel had told him that there was a special Scottish edition of Micro User called MacRo User so he was asking for that.

Eventually I got him to the chalet. It was beautiful, miles from anywhere (including, sadly, the loo). Now I know what they mean by communing with nature.

Anyway, the first few days were

marvellous. He went all over the place. Skye, Aviemore, Sauckiehall Street, we saw Scotland in all its scenic beauty. Only one thing worried me, Bob wasn't whining as much as I would have expected. And he was spending longer and longer in the bathroom.

You wouldn't believe what he was doing there. He was playing with the biggest pocket calculator I've ever seen in my life. Apparently it was a Blunt's pocket computer with all the Basic functions necessary to satisfy Bob's obsession. Clive had apparently lent it him saying: "We're all men of the world, use this if it's absolutely necessary".

Of course I confiscated it immediately and soon Bob was back to his usual whining self.

I thought that maybe searching for the Loch Ness monster might keep him occupied but I should have known better. After an hour he started grinning to himself and I knew something was wrong. "I've got a great idea for a computer game", he blurted out before he could stop himself, "I'm going to call it Nessy Hunt".

With that I bundled him into the car and took him up Ben Nevis. I've found that if I tire him out it gets rid of his funny ideas.

It was at the tourist information centre in Fort William that, through the throngs of tartan-trousered American tourists, I saw the notice advertising a guided nature walk in Glen Nevis. Just the thing to keep Bob occupied, I thought, so there we were at 10 o'clock in the car park at the bottom of Ben Nevis waiting for the ranger.

I'd expected a Scotsman called Angus or

Jock in a kilt or something, but the ranger who turned up was wearing jodphurs, had a Birmingham accent and was called Walter.

Well the journey up the valley was fascinating. Walter really knew a few things about wild flowers. Fragrant orchids, butterworts, mountain saxifrage — he showed us them all.

Of course it was too good to last. As we were coming back down we passed through a quiet, lifeless wood.

"Like Mirkwood", Walter murmured. "Oh are you a Tolkien fan?" I asked. "Not really", he answered, "I just play the Hobbit on my Beeb".

Well it was like a starry saxifrage to a deprived botanist. Bob was in like a shot.

"Have you had trouble with Thorin? Alice did".

And that was the end of the nature walk. The rest of the trail was ignored as Bob and Walter rambled on and on about the Beeb, adventures and micros in general.

And that's how the holiday has turned out. Bob now spends all his evenings in the Tartan Haggis with Walter, knocking back heavy and discussing a map-reading program and a bagpipe tutor for the Beeb.

So once more I'm a micro widow left wondering what's so funny about a "loched file".

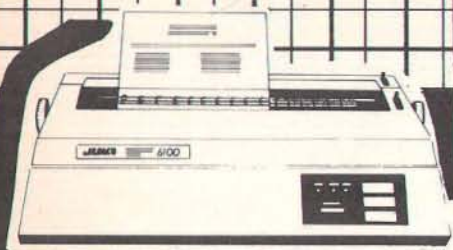
Next year it's Blackpool. See you soon,  
Andrea

P.S. You'll never believe it, but Bob and Walter have actually sold a program. It's a follow-up to Micro Olympics, called the MacRo User Highland Games.



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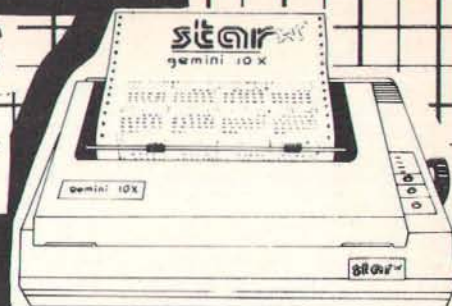
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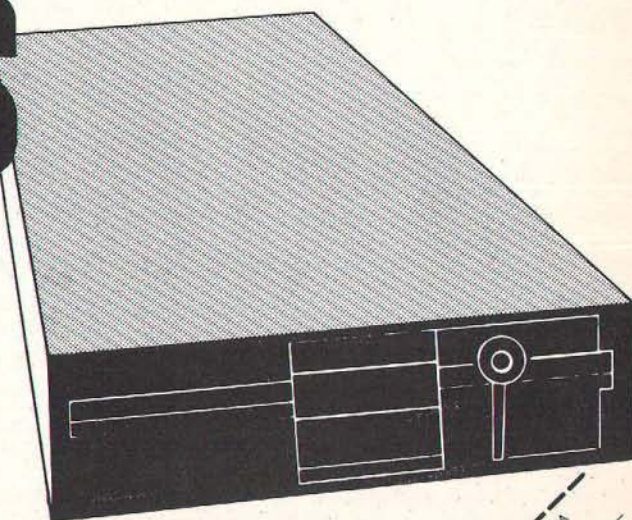
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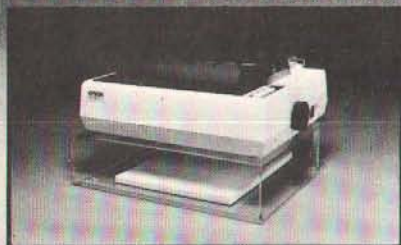
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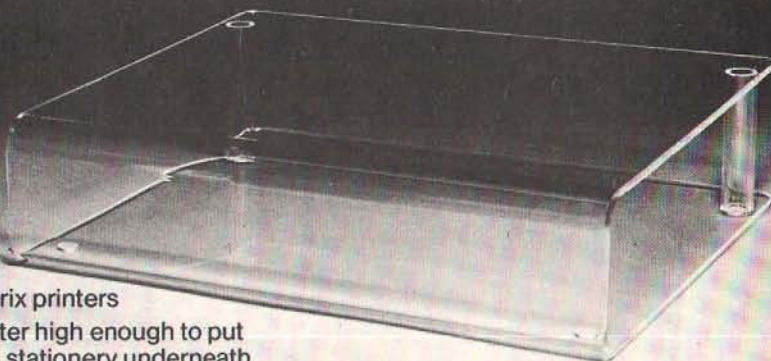


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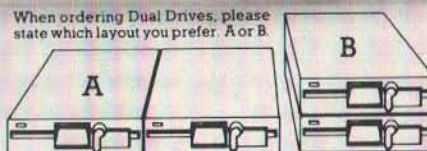
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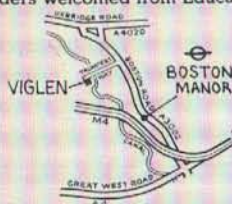
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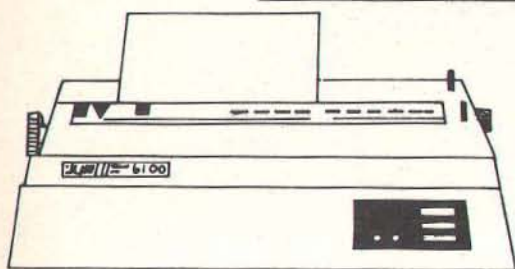




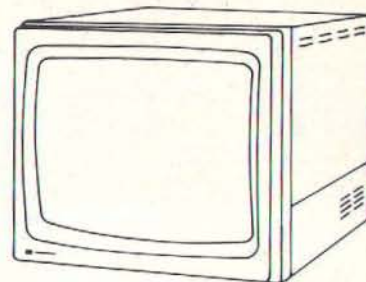
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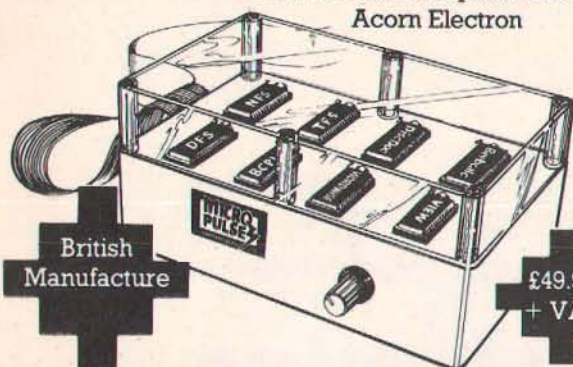
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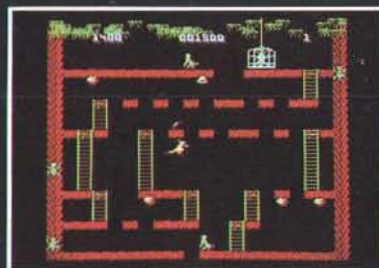
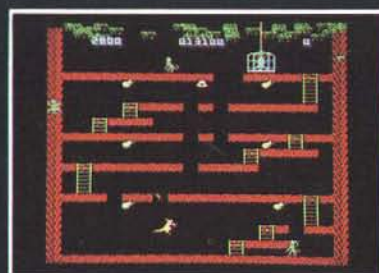
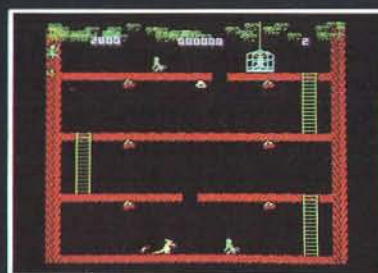
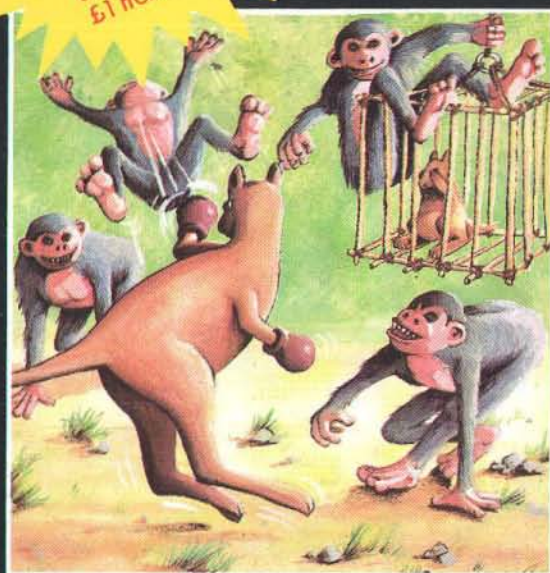


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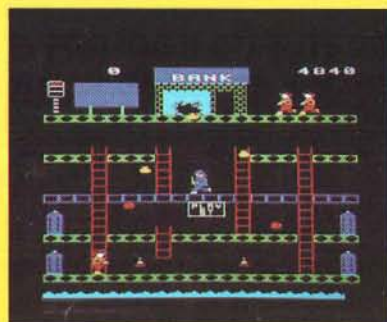
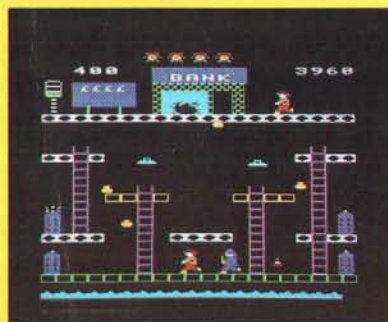
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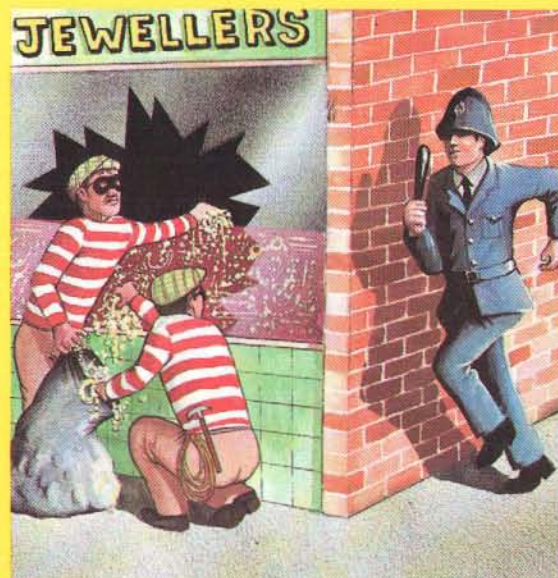
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